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 1            UNITED STATES DISTRICT COURT
           FOR THE NORTHERN DISTRICT OF OHIO
 2               EASTERN DIVISION
 3   ***************************
 4   IN RE:  NATIONAL          MDL No. 2804
     PRESCRIPTION OPIATE
 5   LITIGATION               Case No.
                              17-MD-2804
 6   This document relates to:
 7   The County of Summit,     Hon. Dan A. Polster
     Ohio, et al v. Purdue
 8   Pharma L.P., et al
     Case No. 1:18-OP-45090
 9
10   The County of Cuyahoga v.
     Purdue Pharma L.P., et al
11   Case No. 17-OP-45004
12   ***************************
13       HIGHLY CONFIDENTIAL - SUBJECT TO
14       FURTHER CONFIDENTIALITY REVIEW
15    VIDEOTAPED DEPOSITION OF DAVID CUTLER, Ph.D.
16
17          Saturday, April 27th, 2019
18               8:06 a.m.
19     Held At:
20        Robins Kaplan LLP
          800 Boylston Street
21        Boston, Massachusetts
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23   REPORTED BY:
24   Maureen O'Connor Pollard, RMR, CLR, CSR
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24    VIDEOGRAPHER:  Robert Martignetti
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 1          P R O C E E D I N G S

 2

 3          THE VIDEOGRAPHER:  We are now on the

 4  record.  My name is Robert Martignetti.  I'm a

 5  videographer for Golkow Litigation Services.

 6          Today's date is April 27, 2019, and

 7  the time is 8:06 a.m.

 8          This continued video deposition of

 9  Daniel Cutler --

10          THE WITNESS:  David.

11          THE VIDEOGRAPHER:  I'm sorry.

12          -- David Cutler is being held in

13  Boston, Massachusetts, In Re:  National

14  Prescription Opioid Litigation.

15          Counsel will be noted on the

16  stenographic record.

17          The court reporter is Maureen Pollard,

18  and will now swear in the witness.

19

20          DAVID CUTLER, Ph.D.,

21  having been duly identified and sworn, was

22  examined and testified as follows:

23

24          FURTHER EXAMINATION
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 1  BY MR. KNAPP:

 2      Q.   Good morning, Professor Cutler.

 3  Welcome back.

 4      A.   Good morning, Mr. Knapp.  It's good to

 5  see you again.

 6      Q.   Good to see you, too.  Thanks.

 7          Why don't we pick up where we left off

 8  yesterday.  And so if you could pull out your

 9  report, which is Cutler Exhibit 1, and turn

10  to -- I want to ask about paragraphs 53 and 54

11  which are on Page 31 and 32.

12          And let's start with 54.  What 54 says

13  is, "The combined consequence of these factors

14  was a rapid growth in misuse of illicit opioids

15  and increase in mortality due to heroin and

16  fentanyl which began around 2010."

17          What are the factors that you're

18  referring to were a combined consequence?

19      A.   So the specific factors that I'm

20  referring to there are the ones that are

21  mentioned in the previous paragraphs and that

22  are summarized in Figure 3.1, which is on

23  Page 10 of the report.  And so those are

24  generally referring to the abuse-deterrent
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 1  reformulations of some of the medications, where

 2  obviously OxyContin is a big part of that as the

 3  literature shows, prescription drug monitoring

 4  programs put it in place by many states, and

 5  reductions in prescription sales resulting from

 6  actions of insurance companies, both public and

 7  private, sometimes employers who are sponsoring

 8  insurance policies, guidelines for medical

 9  societies, information provided directly to

10  primary care physicians, and related types of

11  activities.

12      Q.   Is one of the factors that you're

13  referring to in this first sentence of

14  Paragraph 54 what you refer to at the end of

15  Paragraph 53, "The enormous increase in

16  prescription opioid shipments resulting from

17  defendants' misconduct"?

18      A.   The increase in opioid shipments

19  resulting from defendants' misconduct then set

20  the stage for everything that happened

21  thereafter.  So because of the misconduct, there

22  were excessive prescription opioid shipments,

23  excessive use individuals who were addicted to

24  opioids.  Some movement to illegal opioids might
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 1  have happened even in the absence of any other

 2  policy because of ease in different areas of

 3  obtaining illegal opioids.

 4          And some of the transition to illicit

 5  opioids occurred as a result of interventions

 6  that were undertaken because of the widespread

 7  harms that resulted from the excessive shipments

 8  of opioid medications.

 9      Q.   So just to be clear, when you say the

10  combined consequence of these factors, one of

11  those factors is the increase in legal

12  prescription opioid shipments prior to 2010?

13      A.   That is in many ways the driving

14  factor for all of the increase in illicit use.

15  Without that, of course, there would have been

16  no need for any of the policies that came in

17  place afterwards.

18      Q.   And just to be clear, you haven't made

19  any attempt to disentangle or separate out the

20  percentages that each of these factors that you

21  just walked through contributed to the rapid

22  growth in the misuse of illicit opioids after

23  2010?

24          MR. KO:  Object to the form.
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1   A.   I do not -- I did not develop a model

2   that looked specifically at all of the

3   individual components that are involved with

4   the sort of bottom part of Figure 3.1. I didn't

5   -- that would be a different type of an

6   epidemiological framework.

7   But I also think -- again, I just want

8   to reiterate -- not all of the factors are on

9   the same level; that is, the underlying driver

10 was the increase in prescription opioids, and

11 without that there would have been no need for

12 any of the other policies, public or private.

13   So I don't think it's right to think

14 about them as equally -- as apportioning

15 100 percent into what percent is the

16 prescriptions of legal opioids and then what

17 percent would have been this action by this

18 insurance company and what percent would have

19 been this action by this particular government

20 agency. I don't think that's the right model

21 here, because those were -- those actions were

22 taken in response to the excessive quantities of

23 legal opioids. And so they need to be seen in

24 that context rather than as just independent

1   events that occurred.

2   BY MR. KNAPP:

3   Q.   So I want to make sure I understand,

4   Professor Cutler, if you're walking back your

5   testimony from yesterday.

6   Do you remember when you testified

7   that the counterfactual of none of these public

8   interventions would have taken place but for the

9   increase in shipments prior to 2010? Do you

10 remember when you said that that counterfactual

11 was too strong?

12   MR. KO: Object to the form.

13   A.   I want to clarify what I meant by

14 that, and so let me -- if I could, maybe I could

15 return to that sentence. If you recall where --

16 where exactly -- here it is. It's on Page 9, at

17 the bottom of Paragraph 18 on Page 9.

18   What I was talking about was not --

19 was -- it was a kind of statement of fact about

20 what happened as a result of the excessive

21 shipments of opioids. Yesterday you had asked

22 it -- at least I was thinking in the context of,

23 well, suppose that there had been only half --

24 it became in our discussion of suppose some of

1   the shipments were legal and so on. And that

2   involved a hypothetical calculation as to would

3   any of these actions have occurred had there

4   been, for example, only half the set of

5   shipments.

6   And what I answered at that time was I

7   don't feel comfortable making a hypothetical

8   statement about suppose there had been only half

9   the amount of shipments and, therefore, would

10 those actions have taken place. So I can't make

11 any hypothetical statement as to what percentage

12 of shipments would have triggered those actions.

13   What I am saying here is that I

14 believe those actions were a result of the legal

15 shipments that took place. And so I'm not

16 modeling policy, I'm merely stating that the

17 policy was in reaction to those events, and

18 that, therefore, the shipments of legal opioids

19 were the drivers of that policy.

20 BY MR. KNAPP:

21   Q.   You're not comfortable stating that

22 but for the increase in shipments prior to 2010

23 there would not have been these public

24 interventions, including the reformulation of

1   OxyContin?

2   A.   I don't have in this report a model of

3   government behavior, so I'm not trying to say in

4   this report my estimate suggests that the

5   government would have done this under this other

6   hypothetical.

7   So I'm explicitly not doing what in

8   economics terms is called political economy,

9   which is an analysis of how changes in the

10 economies affect government policy. That's not

11 an area on which I've drawn an inference.

12   What I have -- what I am saying is

13 that these policies occurred in light of the

14 enormous increase in opioid shipments, and in

15 particular the belief that those were excessive

16 shipments, and that, therefore, those policies

17 need to be understood in that context.

18   Q.   All right. If we look at

19 Paragraph 55, you state in that paragraph that

20 the shift in the relationship between shipments

21 of prescription opioids and mortality, you say

22 that has been widely recognized in the economic

23 literature.

24   Do you see that?

1   A.   Yes, I do see that.

2   Q.   What articles are you relying on --

3 well, strike that.

4   Are you relying on any articles to

5 support your statement that this relationship

6 has been widely recognized beyond the article

7 cited in Footnote 37?

8   MR. KO: Object to the form.

9   Go ahead.

10   A.   Those two articles make the case very

11 clearly. There are other articles in the

12 literature that cite those articles, obviously.

13 I don't list them specifically.

14   But as a scholar, one of the things

15 that one does is gauges what your opinion is

16 about the accuracy of research in part by what

17 other scholars say about it, say about research

18 in addition to your own reading, so if other

19 scholars find flaws or say that they have not

20 identified flaws or rely on it.

21   So the fact that those studies have

22 been cited favorably by other papers also

23 contributes to my view that -- contributes to my

24 view, but those are the two primary papers that

---

1 address this issue.

2 BY MR. KNAPP:

3   Q.   Now, Professor Cutler, is it your

4 understanding that either of these studies

5 attributed the increase in post-2010 deaths from

6 illegal opioids to pre-2010 shipments? Did

7 either of those studies look at that question?

8   MR. KO: Object to the form.

9 Compound.

10   Go ahead.

11   A.   Both of the studies -- so the Alpert,

12 et al study related the increase in heroin

13 deaths to the use of OxyContin in different

14 states before 2010, so that was a very direct

15 link between pre-2010 opioid shipments and

16 post-2010 heroin mortality.

17   The Evans, et al paper, it used, I

18 believe, although I'd want to -- I'd want to

19 refresh my memory exactly, I believe it used

20 data on the pre-2010 death rate which, of

21 course, is a reflection of prescription opioid

22 use in looking at post-2010 mortality.

23 BY MR. KNAPP:

24   Q.   So let's just start with Evans. I

---

1 want to be clear to make sure I understand what

2 you believe these papers conclude.

3   The Evans study does not attribute the

4 increase in heroin to shipments of prescription

5 opioids prior to 2010, does it?

6   A.   Remember, the Evans paper is looking

7 in the context where opioids were very

8 prevalent, so it's focusing specifically on the

9 event of the reformulation. But if I recall,

10 they also have some cross-sectional results.

11   I see you have a copy of it. If I

12 could look through the copy, I would be more

13 certain about exactly the relationship with

14 pre-2010.

15 BY MR. KNAPP:

16   Q.   Are you aware that Evans attributes

17 the quadrupling of heroin death rates to the

18 August, 2010 reformulation of an oft-abused

19 prescription opioid OxyContin?

20   MR. KO: If you know without looking

21 at the report or the study.

22   A.   I am aware of that. In fact, that's

23 the big event he looks at, which is also, of

24 course, in the context of what came before it as

---

1 we were talking about.

2 BY MR. KNAPP:

3   Q.   All right. I'm handing you what is

4 Cutler Exhibit 8.

5   (Whereupon, Cutler Exhibit Number 9

6   was marked for identification.)

7 BY MR. KNAPP:

8   Q.   This is the Evans study you cite in

9 Footnote 37.

10   MR. KO: Are we at 9?

11   MR. KNAPP: Did we do 8 yesterday?

12   MR. KO: One of them was Kohler

13 Exhibit 1.

14   THE WITNESS: I have Cutler Exhibit 8.

15   MR. KO: 8 was this.

16   MR. KNAPP: Let's mark this as 9.

17   THE WITNESS: It's so rare that people

18 cite my study so frequently that I want to make

19 sure they get their own number.

20   MR. KNAPP: What am I doing here?

21 This is the wrong one. Can I get your copy?

22 BY MR. KNAPP:

23   Q.   Do you see in the abstract at the top

24 the statement "We attribute the recent

1   quadrupling of heroin death rates to the August,

2   2010 reformulation of an oft-abused prescription

3   opioid OxyContin," right?

4   A.   Yes, I do see that.

5   Q.   And there's nothing in the abstract

6   that talks about attributing the increase in

7   heroin death rates to pre-2010 shipments, is

8   there?

9   A.   If I could call your attention to

10   Figure 2, which is the figure that I was in my

11   mind reconstructing. Figure 2 shows the

12   relationship between attributes of different

13   areas prior to 2010, going all the way back to

14   2004, and the increase in heroin death rates

15   after 2010.

16   And one of the points that the authors

17   make there is that the heroin death rate

18   increased the most in the solid -- in the states

19   with the solid black line. Those are the states

20   with the highest rate of deaths from OxyContin

21   and heroin in the period prior to 2010.

22   So what this is saying is that the

23   reformulation had a different impact in

24   different areas, and that it's directly related

1   to the extent of deaths associated with

2   prescription opioids prior to 2010.

3   Q.   Professor Cutler, Figure 1 is not a

4   causation analysis, right? It's a correlation?

5   MR. KO: I believe it was Figure 2

6   that he was referencing.

7   BY MR. KNAPP:

8   Q.   I'm sorry, you were reference --

9   MR. KO: And object to the form.

10   BY MR. KNAPP:

11   Q.   Were you referring to Figure 2?

12   A.   Yes, I was. I was referring

13   specifically to Figure 2B.

14   Q.   Well, same question then. Figure 2B,

15   that is a correlation analysis, not a causation

16   analysis?

17   MR. KO: Object to the form.

18   A.   In this case I think it provides

19   fairly strong evidence of causation. There was

20   a sudden event, which was the reformulation of

21   OxyContin. That sudden event had different

22   impacts on the basis of what states were like

23   prior to 2010.

24   There is no indication in the

1   evidence -- if you look at the line for

2   mortality prior to 2010, there is no indication

3   in the data that heroin mortality was trending

4   higher in the areas that had high OxyContin

5   deaths and high heroin deaths prior to 2010. It

6   was only with that sudden change in policy that

7   there was an increase in heroin deaths

8   disproportionate in the areas with high

9   OxyContin and high heroin deaths relative to

10   other areas, particularly areas with low

11   OxyContin and low heroin deaths. So I believe

12   this actually does provide a quite nice testing

13   of causality.

14   BY MR. KNAPP:

15   Q.   And where -- can you point me to where

16   in the Evans study that they derived this

17   causation conclusion that you've just drawn that

18   pre-2010 shipments caused post-2010 deaths as a

19   result of illegal opioids?

20   A.   Let me look specifically through the

21   paper and provide a very specific reference for

22   you.

23   (Witness reviewing document.)

24   A.   Okay. If you look on Page 2 of their

1   paper, in the top -- in the second column, the

2   column on the right, if I could read a few

3   sentences from the second row of that. "This

4   suggests that there was not a differential shock

5   at the time. Second, we provide additional

6   evidence in favor of the reformulation causing

7   the increase in heroin death that takes

8   advantage of differences in the degree to which

9   reformulation would have affected abusers' home

10   markets. In particular, we note that markets

11   with greater access to heroin and markets with

12   higher rates of pre-reformulation opioid abuse

13   are likely to show more substitution away from

14   opioids and towards heroin than markets with

15   less access to heroin or lower opioid abuse

16   rates. The proxy for the former with whether a

17   state is above or below the median

18   pre-reformulation per capital heroin death rate

19   and the latter with whether a state is above or

20   below the median pre-reformulation per capita of

21   oxycodone consumption. Breaking states into

22   four groups based on these measures, we estimate

23   pre-reformulation trends and post-reformulation

24   trends and test whether their trend breaks after

1 2010 for each of these groups. We find that the

2 heroin death rates increase substantially in all

3 groups. In addition, we find that the trend

4 breaks are largest in states that appear ex ante

5 to be at the highest risk of substitution.

6 These results are previewed graphically in

7 Figure 2B where we display the monthly heroin

8 death rates from 2004 through 2014. While

9 trends" -- for the four groups of states.

10 "While trends in heroin death rates are similar

11 across the groups before the reformulation,

12 afterwards the groups diverge and the states

13 likely to be at the highest risk of substitution

14 rose above the median and both pre-reformulation

15 measures diverged the most."

16   So that's their statement that the

17 reformulation had a different effect based on

18 the initial OxyContin rate and the initial

19 heroin rate. And while they do not use the word

20 causality, that's what's implied by that

21 paragraph.

22 BY MR. KNAPP:

23   Q. And when you say that's what's implied

24 by that paragraph, you don't -- you're not

1 suggesting that this is a regression model that

2 controls for other variables that might cause

3 the change in the death rates?

4   MR. KO: Object to the form.

5   A. As they note specifically, trends in

6 heroin death rates are similar across the groups

7 before the reformulation, so, therefore,

8 there's -- that's a statement that they're

9 saying there's nothing else that would have led

10 to the differential trend in heroin deaths

11 across those areas. So that is getting at --

12 getting at the -- getting at the there's nothing

13 else component.

14 BY MR. KNAPP:

15   Q. Did they run a regression to control

16 for any other factors that might have led to the

17 change in the heroin death rates?

18   A. They then do -- they then do

19 regression analyses. And if you look, those

20 are -- their regression analyses are reported in

21 Table 3, which is on Page 9 of the paper in the

22 top.

23   And so what they're showing is the

24 different trends in death rates in areas based

1 on the initial heroin death rates and the

2 initial OxyContin abuse rates. And so what they

3 show is that the heroin death rates increased

4 much more in the high OxyContin, high heroin

5 areas than in the other areas. That's the

6 coefficient 0.0042, which is in the fourth row

7 of Panel A of the table.

8   Of course, the standard error shows

9 that this is a statistically significant

10 difference between the low OxyContin, low heroin

11 areas and the high OxyContin, high heroin areas.

12 So this is their regression analysis that's

13 designed to test that relationship specifically.

14   Q. So earlier you said that the shift in

15 the heroin mortality rates in high shipment

16 areas was a test -- nice testing of causality,

17 and I think it just refers to their conclusions

18 of causality here as well --

19   A. That's correct.

20   Q. -- the testing of their relationship.

21   What do you mean by the testing of the

22 relationship? Is that a conclusion of

23 causality, or something else?

24   A. I believe it's a causal conclusion.

1 So let me state what I believe their conclusion

2 is both from Figure 2B and from Table 3.

3   There were differences across states

4 in the extent to which opioids were abused.

5 Those differences are very clear and large.

6 Excuse me. Prior to 2010 there were differences

7 in the extent to which opioids were abused.

8 When then the reformulation of OxyContin took

9 place, that led to a significant widening in the

10 heroin mortality rate -- causally led to a

11 significant widening in the heroin mortality

12 rate where the areas that had the most abuse of

13 both legal drugs -- both OxyContin -- excuse me,

14 OxyContin and heroin beforehand had the largest

15 increase in heroin death rates afterwards.

16   And so it is a causal impact of a

17 policy that differentially affected areas that

18 were most affected prior to the policy.

19   Q. Are you aware of any studies that test

20 the relationship between heroin mortality post

21 2010 and any other types of opioids other than

22 oxycodone?

23   A. Not in terms -- I'm not thinking of

24 any in terms of published studies. In my report

1 in Figure 3.4, which is on Page 35 of the
2 report, what we present -- what I present there
3 is the change in heroin mortality in two groups
4 of counties. One is with -- the red line is
5 with high total shipments of opioids, so that
6 includes OxyContin plus all the other opioids,
7 and the blue line is areas with low shipments of
8 opioids, including all opioids, OxyContin and
9 all other opioids.
10   And so this is quite consistent with
11 the Evans, et al study, which is areas with
12 higher shipments of all opioids prior to 2010
13 had a much greater increase in heroin mortality
14 post 2010 than did areas with lower shipments of
15 opioids pre-2010.
16   Q.   All right. So I want to come back to
17 the Alpert study, but I want to ask you about
18 Figure 3.4 while we're on it.
19   This is a -- Figure 3.4 represents a
20 correlation analysis, not a causation analysis,
21 correct?
22   MR. KO: Object to the form.
23   A.   I think of this in the same fashion as
24 I think of the Evans, et al study. On the one

1 hand, the only thing you ever get from a
2 regression -- let me step back from this for one
3 second.
4   As an economist, an applied economist,
5 all any analysis shows you is a correlation.
6 That's all a regression does, is it shows you a
7 correlation between different things. The
8 causality part is added by the researcher who
9 then gives you a reason to believe that what's
10 happening is exogenous.
11   So in this case I'm showing different
12 areas that differed initially in their rates of
13 opioid shipments. Prior to 2010 the heroin
14 death rates in both were on a relatively similar
15 trend. They were both declining, maybe flatter,
16 declining a little bit.
17   And then you have the, of course,
18 exogenous shock of the reformulation of
19 OxyContin combined with the other changes that
20 are going on here that are also, many of them,
21 occurring around this period in time. And then
22 you see a very big divergence post 2010.
23   So you could argue that's all
24 correlation and that would have happened after

1 2010 regardless of whether there was any other
2 policy, and that there would have been that huge
3 divergence regardless of any other -- of
4 anything else going on.
5   And there's nothing to say an
6 individual couldn't do that. In fact, in
7 economic seminars that's what happens all the
8 time, someone presents results and someone --
9 and then there's a generalized discussion as to
10 whether that's truly causal or not.
11   In this case the causality is enhanced
12 by two pieces of evidence -- several pieces of
13 evidence really. The first one being the Evans,
14 et al study where they try to look explicitly at
15 were there any other events that were going on
16 at the time that would have been instead the
17 factor, and they conclude based on their
18 analysis that there were no other events going
19 on around that time that would have had that
20 sharp a change, that immediate a change.
21   Second is the fact that prior to
22 2010 -- so economists will often do what's
23 called a pre-intervention analysis or pre-trend
24 analysis, which is before the events you're

1 thinking of were the -- was the outcome that
2 you're looking at trending differently for the
3 groups that were, say, treated versus not
4 treated, or more affected versus less affected
5 in that case. And so that pre-trend analysis is
6 something that economists do.
7   Figure 3.4 is showing you visually the
8 pre-trend analysis. And you can see that the
9 trend lines look very similar so that at least
10 I, as an individual, if I saw this presented in
11 a seminar or I were asked to referee a paper or
12 I read a paper, I would conclude that these are
13 very similar pre-trend analyses.
14   And then third, you see the very sharp
15 divergence at exactly the time that you're
16 looking, and the divergence sort of continues.
17 It's not a very small blip. It doesn't erase
18 itself after one year or one month in the Evans,
19 et al analysis, but it's a very, very sustained
20 change.
21   And so together that time pattern is
22 what allowed Evans, et al to conclude that it
23 was causal, and what makes me comfortable in
24 Figure 3.4 for exactly similar reasons that this

1   is causal.
2   Q.   In your analysis reference shown in
3   Figure 3.4, you haven't controlled for any other
4   variables like demographic variables, social
5   variables, or economic variables, right?
6   A.   Figure 3.4 does not control for them.
7   The beauty of having the intervention is that
8   none of those variables changed very radically,
9   so none of those variables changed in a way that
10 would explain such a huge shift in heroin death
11 rates in that one period of time.
12   Q.   You -- Figure 3.4 does not show
13 whether these other variables would affect the
14 heroin death rate after 2010?
15   A.   That's correct. Figure 3.4 by itself
16 does not show how those other variables would,
17 but there's no economic or social or demographic
18 variable that changes with anywhere near --
19 anywhere near the rapidity of which these lines
20 are changing.
21   Q.   Is Summit County a high shipment
22 county as you've defined it in Paragraph 60?
23   A.   I think I should know the answer off
24 the top of my head, but I don't know the answer

1   off the top of my head, and -- so I don't want
2   to guess. But I believe -- I should have -- my
3   guess is it would be in Professor Gruber's
4   report. One could see whether Summit and
5   Cuyahoga Counties were high shipment counties or
6   not.
7   Q.   Is Cuyahoga County a high shipment
8   county as you've defined it in Paragraph 60?
9   A.   Again, I don't have it specifically in
10 my report. I know I knew it at one point. And
11 I -- that is because I obviously looked at those
12 counties in specific. But I don't -- to my
13 embarrassment, I do not recall it. And in the
14 absence -- I think it would be in Professor
15 Gruber's report. But in the absence of seeing
16 that specifically, I don't want to say something
17 that might not be correct.
18   Q.   Did you run trend lines for the second
19 and third quartiles that are referenced in
20 Paragraph 60 in Figure 3.4?
21   A.   Yes, we would have run -- we would
22 have -- we would have plotted this directly for
23 all the different quartiles.
24   Q.   And what was the result for the second

1   quartile?
2   A.   I don't recall the result directly.
3   I -- we presented it this way so that we
4   wouldn't confuse things with too many lines, so
5   I don't remember it exactly. All of the areas
6   in general showed very clear, very similar
7   pre-trends, and then very sharp breaks in 2010.
8   Q.   What was the result for the counties
9   in the third quartile?
10   A.   Again, I don't remember it
11 specifically. I do remember that all of the
12 quartiles showed very similar pre-trends and
13 then sharp breaks in 2010.
14   I should also say there's more, of
15 course, more going on with the increase in
16 heroin mortality than just what the shipment
17 rates were like prior to 2010. Of course, that
18 interacted with other things, like, for example,
19 the nature of the heroin that was available in
20 the market, the extent of the supply of
21 illegal -- of individuals engaging in illegal
22 activities.
23   So you wouldn't expect to see this
24 line up one for one with exactly the pre-2010

1   shipments because in any market, when you induce
2   a big change in demand, the actual increase in
3   quantity depends upon what the supply curve
4   looks like. And the supply curve, the ability
5   to supply heroin, certainly differs across areas
6   in ways that cannot be measured. So I would not
7   expect a one-for-one lining up.
8   Q.   Does it matter for your analysis if
9   Summit or Cuyahoga are high shipment counties,
10 low shipment counties, or somewhere in between?
11   A.   For this specific analysis, it does
12 not matter whether Cuyahoga and Summit are high
13 or low shipment counties. For this specific
14 analysis, what I'm doing is I'm simply showing
15 that -- I'm making the point that the increase
16 in heroin mortality is a direct relationship to
17 the extent -- of the extent to which areas were
18 affected by the opioid epidemic prior to 2010.
19 So I'm making that -- I'm using all the counties
20 in the analysis to make that point, not just
21 those two counties.
22   Q.   But the conclusions that you're
23 drawing in this report are specific to Summit
24 and Cuyahoga County, correct?

1   A.   That's correct. What I'm doing in a

2 lot of this report is I'm using national data to

3 estimate truths about the world, to estimate

4 statements about the world, and then I am

5 applying those to data from Cuyahoga and Summit.

6   So in this case, in order to infer

7 whether there was a change in the nature of the

8 types of opioids that individuals are using in

9 that year, it makes sense to look at a lot of

10 different data from across the country from all

11 counties that are similar to Summit and

12 Cuyahoga, then specifically that gets applied to

13 the harms in those areas.

14   And so what I'm trying to do is bring

15 together the best analyses that I can of what's

16 happening, of how to understand the

17 relationships with then the very specific

18 on-the-ground impacts in those two bellwether

19 counties.

20   Q.   Now, you also mention that the extent

21 to which there's an increase in illicit

22 mortality after 2010 depends upon the

23 sophistication of the illegal market that's

24 developed at that time, right?

1   MR. KO: Object to the form.

2   A.   That is correct. It depends on, in

3 essence, what does the supply look like. So

4 what -- in economic terms, what the -- in this

5 case the reformulation and the other actions

6 that reduced the ability and increased the cost

7 of obtaining prescription opioids, what that did

8 was it reduced demand for prescription opioids

9 because when it's more difficult to obtain,

10 people obtain less of it, and it increased the

11 demand for illegal opioids, first heroin and

12 then later fentanyl.

13   The exact extent to which that

14 increase in demand translates into increased

15 quantity depends upon a number of factors; for

16 example, the extent of the illegal market in the

17 area, the extent to which the product can be

18 gotten into that area, the thickness of the

19 market and, therefore, the cost, the

20 transactions costs and the shipments costs

21 of obtaining the product, the various

22 distribution networks and so on. So it depends

23 on all sorts of characteristics. That supply

24 curve of illegal opioids has many, many things

1 that go into it.

2 BY MR. KNAPP:

3   Q.   Let's look at Paragraph 71 of your

4 report. And on the second page on Page 41,

5 second-to-last sentence, it says, "However, the

6 presence and sophistication of drug networks is

7 partially a result of opioid shipments prior to

8 2010 as they create 'thicker' markets for

9 illegal products."

10   Do you see that?

11   A.   Yes, I do see that.

12   Q.   When did the -- well, strike that.

13   When you state that pre-2010 shipments

14 are partially a result -- strike that.

15   When you state that the presence and

16 sophistication of drug networks is partially a

17 result of opioid shipments, what part of the

18 presence and sophistication of the market in

19 2010 was a result of pre-2010 legal prescription

20 opioid shipments?

21   A.   I'm sorry. Can you just repeat the

22 question?

23   Q.   What part -- strike that.

24   What part of the presence and

1 sophistication of drug networks in Cuyahoga and

2 Summit was a result of opioid shipments prior to

3 2010?

4   MR. KO: Object to the form.

5   A.   So I understand the words, so I'll try

6 and answer, but I'm not sure I'm going to

7 directly answer your question, so please let me

8 know if I'm not directly answering your

9 question.

10   The presence and sophistication of

11 drug networks depends on -- in part on how many

12 people are in those markets, so the more people

13 that are in the market the more sophisticated

14 the network becomes. Just like in any market,

15 the more buyers there are, the more quantity

16 there is, the more fluid becomes the market and

17 the ability to get the product that people want

18 to them when they want.

19   So that's just a statement that in any

20 market where -- the opioid shipments prior to

21 2010 sort of created the set of people who would

22 then transition into the illegal opioid market.

23 And the more people that transitioned, the more

24 is the demand for that, and, therefore, the

1 greater the development of that market would

2 be.

3 BY MR. KNAPP:

4   Q. You cannot quantify the contribution

5 that pre-2010 shipments made to the presence or

6 sophistication of drug networks in Cuyahoga or

7 Summit after 2010?

8   A. Unfortunately we don't have data on

9 presence or the sophistication of drug networks

10 anywhere. Because it's an illegal good, we just

11 don't have that. So there's really no economic

12 way to try and do a quantification of that.

13   Q. How did you account for, in your

14 analysis, that the presence and sophistication

15 of illegal drug networks in Cuyahoga and Summit

16 County after 2010 was the result of factors

17 other than shipments of legal opioids?

18   A. If the primary difference across areas

19 were a result of other factors unrelated to

20 anything having to do with consumption of

21 opioids prior to 2010, then in Figure 3.4, when

22 one looks at the relationship between pre-2010

23 deaths from -- or excuse me, shipments of

24 prescription opioids and post-2010 increases in

1 heroin, there would have been no difference

2 across those areas. So if it was all due to

3 something else, one wouldn't see any

4 relationship between the pre-2010 shipments and

5 the post-2010 increases in heroin deaths.

6   Q. Well, I'm not asking if it was all due

7 to something else. How did you account for --

8 if part of it was due to something else, how did

9 you account for that in your analysis?

10   MR. KO: Objection. Object to the

11 form. Objection, asked and answered.

12   A. So two points which I've said before.

13 One is I don't have data on the extent of the

14 illegal market so I don't know the number of

15 participants, I don't know the prices, I don't

16 know the distribution system, so I cannot --

17 it's impossible to estimate something

18 econometrically. It's literally -- without the

19 data you cannot estimate something, so I

20 literally -- just literally could not do it.

21   And then second is the data that I do

22 have in Figure 3.4 show that there is at least

23 some relationship between the initial shipments

24 and the post-2010 increase.

1   Now, as I said, these wouldn't line up

2 one-for-one across counties so you wouldn't

3 explain 100 percent of the differences based on

4 just the shipments pre-2010. There are clearly

5 other factors going on.

6   I don't -- because I don't have any

7 data on them, I don't have any capacity to

8 empirically test whether there was some other

9 change that would have been involved in

10 increasing the extent of illegal markets.

11 BY MR. KNAPP:

12   Q. You didn't run a regression between --

13 that would show -- strike that.

14   You didn't run a regression that would

15 show the relationship between pre-2010 shipments

16 and the sophistication of drug networks or the

17 thickening of drug networks after 2010, correct?

18   MR. KO: Object to the form.

19 Objection, asked and answered.

20   A. I wish I had data for many purposes,

21 many academic purposes. I wish I had data on

22 the presence and sophistication of drug networks

23 in different areas. It would be enormously

24 valuable as an academic to be able to study

1 those, to be able to provide advice to local

2 authorities about what those are and how to

3 address them. Unfortunately, those data just

4 don't exist anywhere, and so I'm just not able

5 to do any econometric analysis.

6 BY MR. KNAPP:

7   Q. And so you couldn't -- well, strike

8 that.

9   Did you consider a hypothesis that

10 before 2010, the break in the market in 2010,

11 that increased shipments of opioids created a

12 thinning in the sophistication and presence of

13 drug networks?

14   MR. KO: Object to the form.

15   A. One of the -- one of the fascinating

16 things -- again I want to come back to Figure

17 3.4. One of the very interesting things is that

18 there does not seem to be a differential trend

19 in the heroin death rate in areas where opioid

20 shipments were higher versus areas where they

21 were lower, so those trends are very similar

22 trends.

23   And so while I don't have the data, as

24 we were talking about, I don't have the data on

1   the presence or sophistication or any other

2   features of the drug networks, I don't see any

3   differences in the primary outcome that I have,

4   which is the mortality rate differently in some

5   areas than in other areas prior to that point.

6   BY MR. KNAPP:

7   Q.   So if we look at Figure 3.4, you've

8   got the different curves for low shipment

9   counties and high shipment counties. At the

10   end, after you run your regression and plot --

11   and apply your shipment coefficient, you're not

12   applying a different coefficient for high

13   shipment counties or low shipment counties,

14   right?

15   A.   Can you just refer specifically to

16   which regression you're referring to?

17   Q.   Let's look at 3.10, Table 3.10 on

18   Page 64. Let's look at column D. This is your

19   shipment coefficient from your regression,

20   right?

21   A.   Yes, that is correct.

22   Q.   What does that reflect?

23   A.   That -- what column D shows is the

24   impact of -- excuse me -- of additional

1   shipments of opioid medications in MMEs,

2   milligrams of morphine equivalent, on the

3   increase in the death rate in the area from the

4   beginning time period that we look at up through

5   roughly the 2010 time period based on the direct

6   model.

7   Q.   And that is a national shipment

8   coefficient that you apply to all counties,

9   correct?

10   A.   It is a regression coefficient for

11   large counties. So it doesn't use all 3,000

12   plus counties, it uses the roughly 400 largest

13   counties.

14   Q.   400 largest counties in the United

15   States, not just in Ohio, correct?

16   A.   That's correct, roughly the 400

17   largest counties in the United States, largest

18   by population in the United States.

19   Q.   And you don't apply a different

20   coefficient based upon whether a county was a

21   high shipment county or a low shipment county?

22   A.   I think what you're asking

23   econometrically is whether, for example, the

24   impact of shipments would enter non-linearly in

1   the model for mortality, because if it entered

2   non-linearly, then one would think that the

3   relationship would be different at a level of

4   high shipments, for example, versus at a level

5   of low shipments. We did not enter that

6   non-linearly. In general, with this number of

7   observations I wouldn't feel completely

8   comfortable about entering it non-linearly.

9   My guess is that at some point we

10   looked at it, although I don't remember

11   specifically. And, you know, had there been an

12   obvious non-linearity, one would think about it.

13   But no, we don't -- we don't have any

14   differential effect at high or low levels.

15   We're assuming that there's a single

16   relationship that comes from additional

17   shipments.

18   Q.   To be clear, though, Figure 3.4 shows

19   a -- you conclude that Figure 3.4 shows a

20   stronger substitution effect in high shipment

21   counties, correct?

22   A.   The way you want to interpret Figure

23   3.4 is as, in essence, what is the -- think

24   about -- the way to relate Figure 3.4 to the

1   analysis that you were referring to in, I

2   believe it was Table 3.10, is that Figure 3.4

3   shows -- let me just come back to this page.

4   Figure 3.4 is showing what is the

5   increase in -- actually, Figure 3.4 is not --

6   excuse me. Figure 3.4 is not -- let me just go

7   back one step.

8   What Table 3.10 is from is our direct

9   model which is estimating total opioid mortality

10   rates over the period from the mid 1990s to

11   around 2010. Figure 3.4 is really looking at

12   what's happening to heroin mortality rate in the

13   period before and after 2010. So Figure 3.4 is

14   not a figure whose results translate directly

15   into the coefficients that then go into Table

16   3.10.

17   Q.   My question was simpler than that.

18   My question was, what your Figure 3.4

19   shows is that there's a higher substitution --

20   strike that.

21   What you conclude is that Figure 3.4

22   shows a higher rate of substitution in high

23   shipment counties, correct?

24   A.   I don't want to say the rate. There

1   is a higher -- there's a greater increase in

2   heroin mortality.

3   Q.   In high shipment counties?

4   A.   That's correct.

5   Q.   Okay.

6   A.   That is correct.

7   Q.   Bear with me just one second.

8   All right. So before we went on a

9   little bit of a tangent we were talking about

10 the studies that you identified as widely

11 supporting your conclusion that shipments of

12 prescription opioids had a relationship to

13 post-2010 mortality from illicit opioids. We

14 talked about the Evans study.

15   Is it your -- do you believe that --

16 strike that.

17   Do you believe that the Evans study

18 attributes the increase in post-2010 mortality

19 from heroin to pre-2010 shipments?

20   A.   What the Evans study does is it shows

21 the confluence of two factors. First, there

22 were --

23   Q.   Actually, can I strike the question?

24 I meant to be asking about the Alpert study now.

1   MR. KO: You've got to -- that's fine.

2   BY MR. KNAPP:

3   Q.   We already talked about the Evans

4   study, so let me -- let me ask you about the

5   Alpert study.

6   A.   Okay.

7   Q.   Do you believe that the Alpert study

8   concludes that shipments of opioids, legal

9   opioids, prior to 2010 caused the increase in

10 heroin mortality after 2010?

11   A.   I believe the Alpert study shows that

12 the use of opioids, legal opioids prior to 2010

13 then created conditions under which making

14 OxyContin more difficult to obtain led to an

15 increase in post-2010 heroin mortality.

16   So it was -- there were confluence of

17 two events; the high shipments of opioid

18 mortality as well as the reformulation, and it's

19 those two together that lead to the -- that they

20 conclude leads to the heroin epidemic.

21   Q.   And Alpert doesn't seek to

22 differentiate the contribution to the increase

23 in heroin mortality between pre-2010 shipments

24 versus the reformulation of OxyContin, right?

1   MR. KO: Object to the form.

2   Go ahead.

3   A.   In this case the two go -- in this

4   case the two are synergistic in that it is both

5   the high level of OxyContin prior to 2010 and

6   the reformulation that are showing up.

7   So it's -- I think yesterday we were

8   talking a little bit about what -- economically

9   what happens when multiple things have to happen

10 for something bad to occur. And in this case

11 Alpert, et al are saying that multiple things

12 happened that led to the heroin mortality

13 increase.

14   MR. KNAPP: All right. Let's mark

15 Cutler Exhibit 10, which is the Alpert study in

16 your footnote 37.

17   (Whereupon, Cutler Exhibit Number 10

18   was marked for identification.)

19 BY MR. KNAPP:

20   Q.   Can you identify where in this study

21 you believe that Alpert, et al attribute the

22 increase in heroin deaths after 2010 to pre-2010

23 shipments?

24   A.   If you look in Table 2 of the paper,

1   which is on Page 18, Table 2 is estimating a

2   model where the dependent variable is the heroin

3   mortality rate per 100,000, and -- excuse me.

4   The change in the heroin death rate per 100,000.

5   And then what they're relating that to in the

6   table is the initial rate of OxyContin misuse,

7   which they're drawing from the NSDUH survey,

8   NSDUH survey.

9   And so they're showing directly that

10 the initial rate of misuse of OxyContin is

11 positively and statistically significantly

12 associated with increases in deaths, heroin

13 deaths. Panel A is showing any heroin death,

14 and Panel B is showing heroin only deaths, so

15 that is deaths where heroin is the only

16 identified substance.

17   Q.   So this is showing a relationship

18 between misuse of OxyContin and heroin deaths,

19 correct?

20   A.   Yes, that's correct.

21   Q.   And are you assuming that misuse of

22 heroin -- strike that.

23   Are you assuming that misuse of

24 OxyContin is a proxy for shipments?

1   A.   In the online appendix to the paper,

2   so not -- it's not physically in what is Cutler

3   Exhibit 10. In the online appendix to the paper

4   they have a chart that shows that explicitly.

5   So they show that the OxyContin misuse rate is

6   positively and statistically significantly

7   related to the shipments of opioids in the area.

8   But you'd need to pull up the online appendix to

9   see that.

10   Q.   And what is the analysis that they

11   run? Is it a regression analysis between

12   OxyContin shipments and OxyContin misuse?

13   A.   They present a figure showing the

14   cross-state relationship between the two. I

15   can't remember whether they present the

16   regression analysis, but I believe they show

17   what the regression line is, so it's very clear

18   what that looks like.

19   Q.   Are there any other studies that you

20   rely on for your statement in Paragraph 55 that

21   the shift in the relationship between shipments

22   of prescription opioids and mortality has been

23   widely recognized in the economic literature?

24   A.   Those are the two studies that I rely

1   upon.

2   I just want to return to my earlier

3   answer, which is that other studies cite those

4   studies. So one thing that any scholar does is

5   they say, well, even if there's -- even if

6   someone hasn't written a counter-paper, if

7   someone writes a paper saying there are X

8   reasons why I believe this paper is incorrect,

9   one takes that into account.

10   The fact that the paper is cited

11   positively and approvingly by other scholars

12   adds to my own assessment of those papers, which

13   is that they are well done and accurate.

14   Q.   In Paragraph 62 you cite a number

15   of -- strike that.

16   Paragraph 62 says, "A number of

17   epidemiological studies have established that

18   much of the increase in the use of illicit

19   opioids after 2010 was the result of addictions

20   resulting from prior use of prescription

21   opioids."

22   Have you identified how much of the

23   increase in the use of illicit opioids is the

24   result of prior opioid shipments?

1   A.   No, I have not -- I do not have a

2   complete answer, so let me give a couple of

3   comments.

4   One is it comes up in a few studies.

5   These studies tend to be relatively small ends

6   because they're small numbers of observations

7   because they're -- oh, thank you so much --

8   because they're typically interviewing people,

9   and so the numbers of people are small. They

10   also tend to be limited to a particular area

11   because they're interviewing people. So they

12   don't claim to be nationally representative, so

13   I haven't seen any nationally representative

14   number.

15   Second is I really view these studies

16   as a kind of confirmation; that is, even in the

17   absence of these studies, my econometric

18   analysis and the results of other analyses lead

19   me to that conclusion. So many -- so the fact

20   that one sees this in the epidemiological data

21   confirms, but it's not the thing that makes me

22   say, oh, well, I didn't believe it before and

23   now I believe it because of those studies.

24   And third, also, and I think we spoke

1   about this a little bit yesterday, the fact that

2   markets became thicker and so it became much

3   more common for people to be using illegal

4   opioids, I would guess, although I haven't done

5   a full analysis of this, I would guess there's

6   some people particularly over time who started

7   on illegal opioids without having started on

8   legal opioids, and that is attributable to the

9   fact that the legal opioids created such a

10   crisis of addiction and that then led through

11   the -- through the mechanism that we focused on,

12   that then led to the creation -- to the

13   substantial, not creation, to the substantial

14   expansion of the illegal markets which then some

15   people will start in.

16   So even those who didn't necessarily

17   start on illegal opioids doesn't necessarily --

18   legal opioids, excuse me, does not necessarily

19   mean that they were not affected by what had

20   happened in the legal opioid market.

21   Q.   Just to be clear, you cannot quantify

22   how much of the increase in use of illegal --

23   well, strike that.

24   You cannot quantify how much of the

1 increase of addictions -- well, strike that.

2   You cannot quantify how much of the

3 increase in the use of illicit opioids after

4 2010 was the result of addictions prior to 2010?

5 I'm just asking if you can quantify it.

6   MR. KO: Object to the form.

7 Objection, asked and answered.

8   A.   I do not quantify it, and I do not

9 know any national attempt in the literature to

10 quantify it.

11 BY MR. KNAPP:

12   Q.   Let's look at Paragraph 63. In

13 Paragraph 63, you say, "The increase in deaths

14 due to illicit opioid use is closely related to

15 the growth in demand for illicit drugs after

16 2010."

17   Where do you analyze and quantify the

18 increase in demand for illicit drugs after 2010?

19   MR. KO: Just so the record is clear,

20 that was just a portion of what's set forth in

21 the first sentence of Paragraph 63.

22   But go ahead.

23   A.   The increase in demand is coming from

24 the substitution effect which we spoke about in

1 reference to both the Alpert, et al study, the

2 Evans, et al study, and Figure 3.4. So all of

3 those show that the specific act of increasing

4 the price of opioids and reducing the ability to

5 get opioids, raising the cost in other ways, led

6 to an increased -- increased demand for illegal

7 opioids.

8   Because I don't have data on the exact

9 consumption of heroin, I cannot estimate a

10 demand curve directly. So that would, of

11 course, be -- the ideal would be to have data on

12 the consumption of heroin and other illegal

13 drugs across different areas. And I don't have

14 that, so I don't have a demand curve.

15   So here what I'm doing is I'm using

16 sort of economic analysis to say that the impact

17 of the price increase, in essence, which is

18 what's shown in all of those analyses, led to

19 a -- would have led to an increase in demand for

20 substitutes.

21 BY MR. KNAPP:

22   Q.   You're looking at mortality from

23 illegal opioids as a proxy for demand, right?

24   A.   What I'm doing here, yes. In

1 addition, the Alpert, et al paper shows that

2 there's a relationship with people reporting

3 heroin use disorder on the NSDUH survey, and so

4 that's another measure of opioids -- of use of

5 illegal opioids.

6   Q.   Did you consider that the demand for

7 opioids may have stayed flat, but the toxicity

8 of heroin increased?

9   A.   So a couple of points. One is the

10 toxicity increase may very well have been a

11 result of the increased demand.

12   But second, I think the Alpert -- so,

13 again, I'm not looking specifically at the

14 numbers of people, but the Alpert, et al paper

15 does look at the numbers -- does look at the

16 heroin OUD population, the heroin disorder

17 population, and does show an increase there.

18   Q.   You would agree, sir, that the sharp

19 increase in heroin mortality after 2010 was due

20 at least in part to the introduction of

21 fentanyl, illegal fentanyl?

22   A.   I think the sentence that you said I

23 don't agree with. So I -- the sentence that I

24 heard you say is the increase in heroin

1 mortality after 2010 is due to the sharp

2 increase in illegal fentanyl. That -- that

3 sentence I don't agree with.

4   Q.   Let me ask the question again.

5   You would agree that the sharp

6 increase in deaths from illicit opioids is in

7 part attributable to the introduction of illegal

8 fentanyl after 2010?

9   A.   Yes. The introduction of illicit

10 fentanyl after 2010, particularly later on after

11 2013 or 2014, is a very big component that I

12 believe is also driven by people's -- by the

13 demand that was initially created by the

14 widespread availability of licit opioids.

15   So as people were addicted to those

16 opioids, licit, legal opioids, and then the

17 cost, both monetary and price and time and so

18 on, of obtaining those drugs increased, people

19 shifted into illegal markets.

20   The first illegal market that occurred

21 was a shift into heroin, which is where one sees

22 the heroin mortality rate first, and then over

23 time it then shifted into fentanyl. And I

24 believe, based on the types of analyses that are

1   done in these studies, that those are all of a

2   continuum.

3   Q. You're not able to quantify the impact

4   that the introduction of illicit fentanyl had on

5   the number of deaths from illegal opioids after

6   2010, correct?

7   MR. KO: Object to the form.

8   A. Unfortunately, no one has data -- with

9   any illegal market, no one has data on the total

10 quantity. So just as we don't have data on the

11 total quantity of heroin, we don't have data on

12 the total quantity of fentanyl.

13   But I also want to come back, I don't

14 think the introduction of fentanyl was a sort of

15 out-of-the-blue event; that is, I believe it is

16 responding to the substitution to the fact that

17 people were addicted to prescription opioids,

18 and then they migrated over. And so in this

19 case, as in many markets where there's a demand,

20 that then leads to supply to enter, and that's,

21 I believe, what's happening here.

22   Q. Do you agree that the increase in

23 deaths from illicit opioids after 2010 is due in

24 part to the introduction of carfentanil?

1   A. I think I have the same answer here,

2   which is that I don't have data to test that

3   econometrically, so I'm not giving -- I'm not

4   offering an opinion about that econometrically.

5   Obviously that is a source of death in

6   the death records, so that's -- it's very, very

7   clear that people are using it and unfortunately

8   dying from it. I believe that the use of

9   carfentanil is related to the fact that people

10 were addicted to prescription opioids and then

11 transitioned into illegal opioids over time.

12   Q. If you were submitting an article for

13 submission to -- well, strike that.

14   If you were submitting an article to

15 an academic journal, would you try to cite all

16 of the papers that both supported and

17 potentially contradicted the conclusions that

18 you were drawing?

19   A. Yes, as a general matter, one would

20 want to refer to all papers that have addressed

21 the subject.

22   Q. And you've read some papers that

23 contradict or don't agree with the conclusions

24 that you've drawn in your report, right?

1   MR. KO: Object to the form.

2   Which conclusions?

3   A. I think I'd want you to be a little

4   more specific about any particular conclusion

5   you're referring to.

6   BY MR. KNAPP:

7   Q. Any conclusion that you have in your

8   report.

9   MR. KO: Any single one in the entire

10 report, Tim?

11 BY MR. KNAPP:

12   Q. You can answer.

13   A. In the report I do point out some of

14 the debates that people have. And you asked me

15 about it yesterday, which was completely fair.

16   For example, I noted the discussion of

17 the Case and Deaton analyses about the deaths of

18 despair and the debate in the literature about

19 the importance of deaths of despair relative to

20 other causes of increased drug deaths so --

21 other causes of increased deaths from opioid

22 drugs. So that's at least one example where I

23 tried to be very clear about what the economic

24 issues and debates are, and then do analyses to

1   address that. So I think I tried to do that in

2   all the areas in which I'm an expert.

3   Q. Any other studies that you can

4   identify that potentially contradict or don't

5   agree with the conclusions you've drawn in your

6   report?

7   MR. KO: Object to the form.

8   A. No. What I'd really like to do is

9   look through every article that I cite and to --

10 many of them will, for example, agree in parts

11 and disagree in other parts, or they'll do

12 something a little bit differently than I do in

13 the report, and I still cite them.

14   For example, I'll just take another

15 example just because it comes to mind, I've

16 cited articles on trends in crime over time that

17 talk about and identify a number of factors that

18 would be leading to trends in crime over time,

19 not all of which are the opioid ones, and some

20 reach different conclusions about things. So as

21 I think about it, I tried to be -- I did not go

22 into it with a bias of citing only articles that

23 supported my conclusion.

24 BY MR. KNAPP:

1   Q.   Okay. We'll talk about the Case and

2 Deaton articles later this morning.

3   A.   Okay.

4   Q.   But I want to take a break after this

5 question, but I do want to ask you it before we

6 take a break.

7   Do you believe that Professor

8 Rosenthal's model meets the standard for

9 submission to a peer-reviewed academic journal?

10   A.   Yes, I --

11   MR. KO: Objection. Scope.

12   But go ahead.

13   A.   Yes, I do believe Professor

14 Rosenthal's article meets the standard for

15 submission to an academic journal.

16   MR. KNAPP: Okay. Let's take a break.

17   THE VIDEOGRAPHER: The time is

18 9:24 a.m., and we're off the record.

19   (Whereupon, a recess was taken.)

20   THE VIDEOGRAPHER: The time is

21 9:42 a.m., and we're on the record.

22 BY MR. KNAPP:

23   Q.   So, Professor Cutler, I want to make

24 sure I understand sort of how far your

1 thickening theory goes. So let's imagine a

2 scenario where there's a factory in China

3 sometime next year develops a new, stronger form

4 of opioid, stronger than carfentanil, stronger

5 than fentanyl. Under your theory and under the

6 opinions you offer in this case, are the

7 defendants responsible for the deaths resulting

8 from that opioid?

9   MR. KO: Object to the form.

10   A.   So let me give you what the evidence

11 shows. There were obviously people -- not

12 obviously. There were people who became

13 addicted to prescription opioids in the course

14 of the 2000s. That -- those people, once they

15 were addicted, were then -- had strong demand

16 for opioids. As it became more difficult to

17 obtain those legally, people moved into illegal

18 substances, first heroin and then fentanyl.

19   There are two aspects of the -- that

20 shift that are directly related to the

21 misconduct on the part of the defendants. The

22 first -- and in the example you cite.

23   The first is the demand; that is,

24 creating a product for which there is no demand

1 will lead to no sales. So deaths that result

2 from the fact that there are people who became

3 addicted and then had demand for illegal

4 opioids, that part is attributable to the

5 defendants' misconduct.

6   In addition, the extent of the

7 delivery markets, possibly the -- possibly the

8 reason for developing it, although not -- well,

9 let me list that as a third possible reason.

10   So the second one is the extent of the

11 markets that then bring that delivery to people,

12 those -- the extent of those -- that bring that

13 new type of fentanyl to people. Those markets

14 are thicker because of the demand that was

15 created by the misconduct on the part of the

16 defendants.

17   And so that thickness of the market

18 then allows any new innovation, a new type of

19 opioid, to be brought in, if you will, more

20 efficiently; that is, at lower cost, in greater

21 quantities, distributed in easier ways, perhaps

22 people being more willing to take it who might

23 otherwise not be willing to take it.

24   Third, there is some economic

1 literature that new products are created in

2 response to demand. The leading -- so that is

3 one would not be looking for a new product in

4 the absence of demand.

5   In this third part, the leading

6 industry for which that evidence is cited is the

7 pharmaceutical industry where the pharmaceutical

8 industry responds quite appropriately to demand

9 from individuals for relief from certain

10 diseases or illnesses, and then develops

11 medications that respond to that.

12   And so it is also possible -- I have

13 not done an economic analysis, but it is

14 absolutely theoretically possible that the

15 development of new types of opioids, legal or

16 illegal, would be a response to the demand that

17 was brought about by the misconduct on the part

18 of the defendants.

19 BY MR. KNAPP:

20   Q.   And so let's take another

21 hypothetical. Let's say in 50 years another

22 factory, a different factory in China comes up

23 with yet a stronger form of opioid. No one can

24 anticipate it at this point, but it's stronger

1 than anything that's on the market now. Under
2 your theory, are the defendants responsible for
3 the deaths that would result from that new
4 opioid product?
5   MR. KO: 50 years from now or 50 years
6 from 2010?
7   Object to the form.
8   A.   One would need to do an economic
9 analysis. So some technological innovation
10 comes out of the blue. So, for example, if one
11 comes back to the pharmaceutical example, some
12 pharmaceuticals just happen because a scientist
13 is looking at something and she or he discovers
14 that a compound they were looking at has an
15 effect on the part of the body that they never
16 thought about, that they never anticipated, and
17 so that comes out of the blue, and that's an
18 important form of scientific advance.
19   Some other innovation occurs in
20 response to demand; that is, there are a number
21 of people suffering from a particular type of
22 cancer which is currently not able to be treated
23 well, and pharmaceutical companies then devote
24 resources and scientists' ability and effort to

1 developing -- to developing a treatment for
2 that.
3   Just knowing that there is a treatment
4 for a particular type of cancer does not say for
5 sure whether it was a result of the demand or
6 whether it was a result of just happenstance.
7 And in the case of the beneficial pharmaceutical
8 we got lucky; in the case of the harmful opioid
9 we got unlucky.
10   So I couldn't say theoretically
11 whether a new drug, a new type of fentanyl
12 analog developed 50 years from now was a
13 response to what happened. One would need to do
14 an econometric analysis to understand what --
15 the drivers of different types of medications
16 and to consider the various factors that were
17 involved.
18   So I would need -- so the answer to
19 your immediate question, would I automatically
20 assume that that was related to the defendants'
21 misconduct, no, I would not.
22 BY MR. KNAPP:
23   Q.   So let's --
24   A.   But it doesn't -- but that's a

1 statement that one needs to do analysis to learn
2 the answer, not just theorize.
3   Q.   All right. So let's move out of the
4 realm of theory and talk about your model.
5   You understand that if there's this
6 new opioid product developed by a factory in
7 China, no one knows about it now, comes onto the
8 market a year from now, and then there are
9 deaths associated with that, you understand that
10 the way your model works is you would hold the
11 defendants responsible for the deaths resulting
12 from that introduction of a new opioid that no
13 one can anticipate right now?
14   MR. KO: Object to the form.
15 Objection, mischaracterizes his testimony and
16 the report.
17   But go ahead.
18   A.   Let me give you an empirical
19 statement. The Alpert, et al paper, which we
20 were talking about just a few minutes ago, shows
21 both that heroin deaths are related to the
22 pre-2010 use of prescription opioids and that
23 fentanyl deaths are related to the pre-2010 use
24 of opioids.

1   So, for example, if you look at -- I
2 just want to find the appropriate table. If you
3 look at Table 5 of the Alpert, et al study, that
4 is the relationship between the initial use of
5 OxyContin and the death rate from synthetic
6 opioids, panel A is any synthetic opioid
7 involved in the death, and Panel B is synthetic
8 opioid deaths only per 100,000.
9   And so just focus for a moment on
10 Column 5 of Table 5, which is on Page 25. So
11 including both the state and time varying
12 covariates as well as various policy measures in
13 their regression estimates, both for any
14 synthetic opioid death and for synthetic opioid
15 only deaths, there is a relationship that areas
16 that had higher initial use of OxyContin have
17 increasing deaths -- have great -- excuse me,
18 greater deaths from synthetic opioids as well,
19 so the coefficient is 1.137 for any synthetic
20 opioid death, and, of course, it's statistically
21 significant in that regression.
22   So here they're showing
23 econometrically that not only was the use of
24 heroin -- deaths from heroin related to use of

1 OxyContin, but also deaths from fentanyl are

2 related to the initial use of OxyContin in the

3 area.

4 BY MR. KNAPP:

5   Q.   I don't think that possibly could have

6 been more nonresponsive to my question. My

7 question was about your model.

8   A.   I'm sorry you feel that way.

9   Q.   You didn't mention your model once.

10 So I'm going to try to ask the question again.

11   You understand that your model -- I'm

12 not talking about Alpert, I'm not talking about

13 Evans, I'm talking about your model. You

14 understand that?

15   A.   Uh-huh.

16   Q.   You understand that your model would

17 hold these defendants responsible from deaths

18 that would result from the introduction of an

19 illicit -- a new illicit opioid that was

20 developed in China in a factory that no one

21 knows about right now, if it was introduced in a

22 year, that your model would hold the defendants

23 responsible for those deaths? Do you understand

24 that?

1   MR. KO: Object to the form.

2   A.   I don't believe that's accurate. In

3 order to apply the model going forward, you need

4 to make sure that you think the conditions are

5 appropriate. So if, for example -- let me go

6 back one second.

7   So what my model does is it translates

8 the shipments of opioids into the harms that

9 were then incurred. To the extent that one

10 thinks that there was another factor -- and then

11 it -- and then it takes out -- then it uses as

12 an input -- it uses as an input the shipments

13 that are due to misconduct on the part of the

14 defendants.

15   To the extent that there are shipments

16 that do not result from misconduct on the part

17 of defendants, that are due to something else,

18 for example, if there just happened to be

19 something else in the market, then that would

20 show up as being not an impact -- that would --

21 that would show up then as having no impact on

22 harms.

23   So I think what you're saying is could

24 one -- should one be sensitive to over which

1 time period, and is it truly the case that in

2 different years one is correctly measuring the

3 share of use that's related to misconduct on the

4 part of the defendants. If there is a reason

5 why that should change, then one could change

6 that input, and then the model would correctly

7 give the impact of the shipments that are due to

8 misconduct.

9   So it's not that the model assumes

10 that. It's really that's taking as an input --

11 the model requires as an input the shipments due

12 to misconduct on the part of the defendants.

13 And then one could say -- and then -- to the

14 extent that that changes, then just -- then that

15 would show up in that input.

16 BY MR. KNAPP:

17   Q.   So let's assume that there's no new

18 alleged misleading marketing. Is it your theory

19 that that would stop all of the attribution of

20 harm to the defendants based upon deaths that

21 later occur? And how is that consistent with

22 your substitution theory, sir?

23   MR. KO: Object to the form.

24   Which question do you want him to

1 answer?

2 BY MR. KNAPP:

3   Q.   You can answer.

4   MR. KO: Which?

5   A.   Could you just repeat the question?

6 BY MR. KNAPP:

7   Q.   Let's assume in a hypothetical that

8 there's -- starting today that there's no new

9 misleading marketing and there's a death

10 tomorrow. Is it your opinion that the

11 defendants cannot be responsible for that death

12 that happens tomorrow? Is that your opinion?

13   MR. KO: Object to the form.

14   A.   No, that's not my opinion. The impact

15 of the marketing, the mis -- the impact of the

16 marketing -- misconduct in marketing on the

17 shipments of opioids comes from Professor

18 Rosenthal's analysis.

19   So if there were any marketing in the

20 past or in the future that was not misconduct,

21 she would then take those out of her estimates,

22 and then we would have estimates of those that

23 were corrected for the true estimate of

24 misconduct, and then I would then give a

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 1   different estimate of the harms.  If there were
 2   less misconduct, there would be less harms
 3   associated with that.
 4         It is also -- but it is also not the
 5   case that the model starts fresh at every moment
 6   because people are addicted.  So even deaths
 7   that occur after any period of misconduct in
 8   marketing had -- or in distribution had --
 9   monitoring of distribution had occurred, some of
10   those deaths will still be a result of the prior
11   misconduct because of the addiction component.
12   BY MR. KNAPP:
13      Q.   Under your thickening theory, are
14   defendants responsible for any increases in
15   deaths associated with cocaine use?
16      A.   In the model here, that are here, the
17   only deaths that we look at are deaths from
18   opioid use.  So any death which has just cocaine
19   use is not counted as a harm associated with
20   opioid shipments.
21      Q.   I understand that's how your model
22   works.  I'm trying to understand the scope of
23   your thickening theory.
24         And so my question is, under your
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 1   thickening theory, are defendants responsible
 2   for deaths associated with cocaine use?
 3         MR. KO:  Objection.  Asked and
 4   answered.
 5      A.   I'm not making a theoretical statement
 6   about that.  There are arguments in the
 7   literature about, as we were talking about
 8   yesterday, about gateway drugs.  I'm actually
 9   not -- so I actually don't want to make it be a
10   theoretical discussion, unless you want to ask
11   about it theoretically.  I will just say as an
12   empirical matter, the model does not attribute
13   deaths from cocaine to the misconduct of the
14   defendants.
15   BY MR. KNAPP:
16      Q.   Sitting here today, you're not willing
17   to rule out the possibility that defendants are
18   responsible for increases in deaths associated
19   with cocaine?
20         MR. KO:  Objection.  Asked and
21   answered.
22      A.   In my model, there is no impact at all
23   of deaths from cocaine on the harms due to
24   defendants.  So it's not in the data.  It's not
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 1   in the results.  It's not in the conclusions
 2   that I draw.
 3   BY MR. KNAPP:
 4      Q.   Well, you said if I want to have a
 5   theoretical discussion, you would have it, so
 6   let me ask you as a matter of theory.
 7         Under your thickening theory, are
 8   defendants responsible for increases in deaths
 9   associated only with cocaine?
10      A.   So there is theoretical work that has
11   been done.  I have not seen -- ultimately this
12   is then an empirical question as to whether
13   people transition from opioids to cocaine -- or
14   whether -- excuse me, whether opioids are, in
15   essence, a gateway drug to cocaine.  I do not
16   know of any empirical literature on that at all.
17         So all -- I can tell you that it's a
18   theory, and I could tell you arguments as to why
19   it would be, and I could tell you arguments why
20   it wouldn't be.  Ultimately, as an applied
21   economist, one needs to see empirical evidence,
22   and there is no evidence on it that I know of.
23      Q.   When did the market in Cuyahoga County
24   begin thickening, under your theory?
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 1         MR. KO:  Object to the form.
 2      A.   Begin thickening I don't have an
 3   answer to because I cannot measure how thick the
 4   market is.  So I would love to have data on the
 5   extent of the market for illegal drugs in
 6   different areas over time, that's what I would
 7   love to have, and then I could give you an
 8   empirical analysis because I could plot that and
 9   I could show you where the breaks were, where
10   the breaks in that were.  I don't have an
11   estimate of that because those data do not
12   exist.
13         The only thing I can tell you is about
14   heroin and other illegal drugs, what happens to
15   the death rates.  That's the only thing I can
16   tell you.  We were looking at those earlier, and
17   so you saw what those trends looked like.  But I
18   don't have an empirical way of answering your
19   question.
20   BY MR. KNAPP:
21      Q.   How much thicker was the illegal drug
22   market in Cuyahoga County in 2010 than it was in
23   1995?
24      A.   So, again, you're asking an empirical
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1   question to which I would love to know the
2   answer. I would love to know the answer as an
3   economist. I would love to know the answer as a
4   public policy person. I would love to have a
5   measure of the amount of illegal -- the amount
6   of use of illegal opioids over time.
7   Unfortunately, I don't have that.
8   So the equivalent of the ARCOS data is
9   what one would want in order to have that, and
10   there just is nothing like that that indicates
11   the extent of the illegal market.
12   Q.   Let's turn to Paragraph 47 of your
13   report. In your regression models you use --
14   well, strike that.
15   In the way that you apply your
16   regression models, you use mortality as a proxy
17   for the other harms that you analyzed, right?
18   MR. KO: Which regression models?
19   Object to the form.
20   A.   There are different regression models.
21   In some of the regression models I use mortality
22   as a proxy for other harms. I also present
23   analysis using crime rates as the dependent
24   variable, and in that analysis I do not use

1   mortality as a proxy for the harms, I'm looking
2   directly at the harms using crime.
3   BY MR. KNAPP:
4   Q.   Okay. And in Paragraph 47 you say
5   that crime in foster care -- strike that.
6   In Paragraph 47 you admit that crime
7   in foster care placements would exist at some
8   level even in the absence of opioids, right?
9   A.   Yes, that's correct.
10   Q.   And so you're admitting that there's a
11   different relationship between foster care and
12   opioid shipments than there is between opioid
13   mortality and opioid shipments, right?
14   A.   That's not the distinction I'm making
15   there.
16   Q.   Well, let me -- it's a true statement,
17   right, that there's a different relationship
18   between foster care and opioid shipments than
19   there is between opioid mortality and opioid
20   shipments?
21   MR. KO: Object to the form.
22   A.   I don't know empirically whether the
23   relationship would be similar or different. So
24   I think you're saying would there be a different

1   empirical relationship. Because I can't measure
2   the empirical relationship the same way, I can't
3   do a comparison across those and say if they're
4   different.
5   BY MR. KNAPP:
6   Q.   How did you factor into your model the
7   fact that you can't model the relationship
8   between opioid shipments and foster care and
9   opioid mortality and shipments?
10   A.   As is stated here, I'm using mortality
11   as an estimate of the share of the harms that
12   are due to shipments of opioids, so I'm going to
13   assume that that share of the harms is due to
14   opioids, and that's a fairly -- obviously a very
15   severe form of harm.
16   Similarly, child removal is a very
17   severe form of intervention with a family. It's
18   a very, very big form of intervention with the
19   family.
20   So what I do is I use data on the
21   share of deaths that are a result of opioid
22   shipments to then say I'm going to assume that
23   that same share of children removed from their
24   families because of opioids, that same share is

1   also due to the opioid shipments as opposed to
2   other reasons why families may be using opioids
3   and then child removals associated with that.
4   Q.   Professor Cutler, you can't say with
5   any degree of economic certainty that the
6   correlation between opioid shipments and any
7   categories of harms that you analyzed other than
8   mortality and crime are the same as the
9   relationship between opioid mortality and
10   shipments, right?
11   MR. KO: Object to the form.
12   A.   I want to focus on the crime ones for
13   a second because the crime ones I do have the
14   data to estimate directly --
15   BY MR. KNAPP:
16   Q.   Sir, my question was other than --
17   MR. KO: Let him finish the answer.
18   BY MR. KNAPP:
19   Q.   My question is other than mortality --
20   MR. KO: Tim, you cut him off. Let
21   him finish the answer.
22   BY MR. KNAPP:
23   Q.   Do you understand that my question --
24   MR. KO: Tim --

1   BY MR. KNAPP:

2   Q.   -- was other than mortality?

3   MR. KO: Tim, you cut him off. He was

4   in the middle of an answer.

5   BY MR. KNAPP:

6   Q.   Okay. I just want to make sure you

7   understand what the question is.

8   MR. KO: Before -- why don't you go

9   ahead and finish your response to the earlier

10   question.

11   A.   Okay. With crime, I can do an

12   analysis where I directly estimate the impact of

13   opioid shipments on crime, and then I can

14   compare that to what I get when I look at the --

15   when I do it through using the impact of

16   opioid-related shipments on mortality, and then

17   applying that percentage to the opioid-related

18   component of crimes.

19   And in that case, the direct analysis

20   of the crime effects actually suggest a greater

21   impact of opioid shipments on crime than I get

22   using the more -- using the method through

23   mortality.

24   I cannot do the same for the other

1   harms because I don't have the data, but I took

2   from the crime analysis that one -- that the

3   results were in the same ballpark, so,

4   therefore, that I took confirmation.

5   And, second, that, if anything, I may

6   be underestimating the effect by looking through

7   the mortality lens as opposed to being able to

8   estimate the direct effect.

9   But that said, I don't have hard and

10   fast empirical data to say with absolute

11   certainty the effect if I could estimate it a

12   different way would be stronger.

13   BY MR. KNAPP:

14   Q.   So I want to ask you about the

15   mortality data that you use in your regressions.

16   Did you exclude any counties that qualify as

17   large counties in any of the regressions that

18   you ran?

19   A.   There were four counties that were

20   excluded because they had very high -- they are

21   in areas where there was known to be a good deal

22   of transshipment, that is, drugs that were sent

23   to that area and then sent elsewhere, and

24   then -- excuse me, not sent elsewhere, but

1   people from elsewhere would go to those areas to

2   obtain medication and then either consume it

3   there or take it back to where they were. And

4   they were identified by areas where the

5   shipments per person, so the MME per person,

6   were extremely high relative to the rest of the

7   large counties.

8   Q.   One of the counties that you removed

9   was Franklin County, Ohio, right?

10   A.   I believe that's correct.

11   Q.   How did you determine that there were

12   transshipments out of Franklin County, Ohio?

13   MR. KO: Object to the form.

14   A.   What -- so, of course, we don't know

15   about transshipments from each county. What we

16   did was we excluded the four counties that were

17   very appreciable outliers in the shipments per

18   capita, which my theory is that there was a good

19   deal of transshipment, but I do not have a

20   direct estimate of that.

21   BY MR. KNAPP:

22   Q.   Were you able to quantify the amount

23   of transshipments out of Cuyahoga or Summit

24   County into other counties of Ohio?

1   A.   No, I was not able to calculate the

2   transshipment from either -- out of either

3   Cuyahoga or Summit.

4   Q.   So you didn't make any adjustments for

5   if someone from a neighboring county filled

6   their prescription in Cuyahoga County and then

7   consumed it as a resident of a different county?

8   A.   I wasn't able to do that. And, in

9   fact, what that does is it creates measurement

10   error in the independent variable. So if you

11   think about what I would like to do, I would

12   like to relate deaths to use of opioids in that

13   area.

14   What I have is shipments of opioids to

15   the area. Since shipments are not exactly equal

16   to use, there is measurement error; that is, the

17   variable is -- the variable that I'm trying to

18   measure use is measured with error, that is

19   shipments.

20   As is standard in models with

21   measurement error, this will lead to my

22   coefficient being too low; that is, it will

23   attribute fewer deaths to opioid use than would

24   happen correctly, so that the percentages that I

1   estimate because of this from the direct model
2   are actually lower than would be the case if I
3   did -- if I had the ideal data.
4   Q.   Would you agree that for counties that
5   are a center of a metropolitan area with a
6   number of surrounding more rural counties, you
7   might expect that people from the rural counties
8   would come into the urban county to fill
9   prescriptions?
10   MR. KO: Object to the form.
11   A.   Yes, it's possible that people from
12 rural areas -- of course, it would depend a lot
13 on the characteristics of the area, but it is
14 possible.
15 BY MR. KNAPP:
16   Q.   So would you expect higher per capita
17 shipments in those types of counties because the
18 county population would understate the
19 utilization?
20   MR. KO: Object to the form.
21   A.   In the hypothetical that you're
22 giving, or in the example that you're giving, it
23 is the case that the shipments to the area are
24 only a noisy measure of the use in the area,

1   they have -- there is measurement error in that.
2   That, as we were just talking about, that would
3   lead to my estimates of the impact of shipments
4   on mortality being too low; that is, it would
5   lead to not attributing enough deaths to the
6   opioid shipments.
7   And so that's part of the reason why I
8   believe that the direct model estimates are
9   conservative in that they are -- I know because
10 of measurement error that they will yield too
11 low an impact of misconduct on the part of the
12 defendants.
13 BY MR. KNAPP:
14   Q.   What is the measurement error that
15 you're referring to?
16   A.   If you think about a regression model,
17 you're trying to relate one outcome, in this
18 case mortality change, to another outcome, in
19 this case consumption of opioids. That's the
20 ideal thing you'd want is consumption of
21 opioids.
22   So if I -- I would get one effect if I
23 estimate the relationship between mortality and
24 consumption of opioids. Instead of consumption

1   of opioids, I have only a proxy for it. And
2   that proxy is, let's say, the true amount plus
3   some noise, some differences across different
4   areas.
5   Because it's got noise, that noise is
6   not related to the mortality component. As you
7   said, the noise may be people coming in from
8   rural areas or people coming in from other
9   cities entirely and then getting medications and
10 leaving, so that noise is not going to be
11 related to mortality in the area.
12   Therefore, since my -- the variable
13 that I have in there included has got a true
14 effect plus noise, which has no effect. When I
15 estimate the relationship between mortality and
16 that combined, it's going to be lower than if
17 I'd estimated the relationship between the
18 mortality and the true variable I want, because,
19 in essence, it's going to be an average between
20 the true effect from that true variable I want
21 and the zero that comes from all that noise.
22   And so having all that noise means
23 that the estimate will be below the estimate of
24 the true effect because it's going to be biased

1   towards zero.
2   Q.   Wouldn't it depend on a
3   county-by-county basis whether there's
4   transshipments into the county or out of the
5   county, whether you've overstated it or
6   understated the amount of consumption?
7   MR. KO: Object to the form.
8   A.   That's correct. The amount of
9   consumption in the area may be higher or lower
10 than shipments depending upon the -- whether
11 people are moving -- obtaining their medications
12 in there or in other pleases or so on. And it's
13 exactly the fact that that noise is random; that
14 is, in some counties it's going to be one way,
15 in other counties it's going to be another way.
16 It's exactly the result of that randomness that
17 you have this noise component that says I'm
18 looking at the relationship between mortality
19 and something true, plus something I can't get
20 rid of which has no effect, it's just a random
21 component.
22 BY MR. KNAPP:
23   Q.   Well, in this case we're focused on
24 Cuyahoga and Summit Counties. So do you know,

1   sir, one way or another whether there was net

2   transshipments into or out of either Cuyahoga or

3   Summit County?

4   A.   I have no data on whether there are

5   net transshipments into or out of Summit or

6   Cuyahoga Counties.

7   Q.   Did you run your regression models

8   with the four counties that you excluded --

9   strike that.

10   Did you run any of your regression

11   models with the four counties you've excluded

12   included in the regressions?

13   A.   Yes, I did run the models with those

14   four counties included.

15   Q.   And do you know what the impact was?

16   A.   I do not remember the specific number

17   offhand. I recall that the answers were very

18   similar -- that the estimates were very similar

19   to those I reported.

20   Q.   Let's turn to Paragraph 65. This is a

21   discussion -- strike that.

22   Paragraph 65 starts the discussion of

23   your direct regression model that you ran for

24   licit and illicit mortality through 2010,

1   correct?

2   A.   Yes, that is correct.

3   Q.   And as we discussed earlier, this

4   regression model is a correlation analysis,

5   right?

6   MR. KO: Object to the form.

7   A.   All regressions are by definition

8   correlations. All that a regression does -- I

9   teach my classes this, so I preach it very

10   widely -- all that a regression does is gives

11   you correlations, gives you very sophisticated

12   correlations, but they're correlations.

13   The causality comes from the

14   interpretation of the individual who is using

15   the results as to whether they want to provide a

16   causal interpretation and, if so, make the

17   argument that that's a -- that that's a causal

18   interpretation.

19   BY MR. KNAPP:

20   Q.   So I just want to make sure we

21   understand your opinion here. Your opinion is

22   that the increase in opioid shipments prior to

23   2010 caused an increase in both licit and

24   illicit mortality prior to 2010, is that right?

1   A.   In the -- so what -- I want to

2   distinguish between the -- what the regression

3   says, which is that the regression is just

4   giving a correlation. It is then my

5   interpretation that it is -- that the

6   relationship is a causal one; that is, that the

7   increase in shipments led to the increase in

8   mortality.

9   Q.   And what is the basis for your

10   conclusion that there's a causal relationship?

11   A.   There's several bases for the

12   conclusion that it's a causal relationship. One

13   is that I've controlled for as many demographic,

14   economic, and social factors as I possibly

15   could, and I find that those do not explain the

16   relationship between shipments and mortality.

17   In addition, there is not a

18   theoretical reason to think that shipments would

19   have increased more in areas where for other

20   reasons people were going to die more of opioid

21   use.

22   So, for example, if you go back to

23   Figure 3.4 -- excuse me, I wish I remembered

24   which page -- Figure 3.4 which is on Page 35,

1   there is no trend, for example, in heroin

2   mortality rates in areas that had -- over the

3   1999 to 2010 time period in areas that had

4   greater and lesser shipments of opioids.

5   So I don't see any other indication

6   that the shipments of opioids to the area were a

7   response to what would have been an increase in

8   death rates for those medications in the absence

9   of the increase in shipments.

10   Q.   Any other bases that support your

11   conclusion that there's a causal relationship

12   between shipments of legal opioids prior to 2010

13   and licit and illicit mortality prior to 2010?

14   A.   No. Let me -- those are the two.

15   Q.   So you would agree, sir, that your

16   regression would overstate the causal

17   relationship if there are factors or variables

18   that are not included in your model that may

19   explain the increase in mortality that are not

20   correlated with the variables that you included,

21   that are not perfectly correlated?

22   MR. KO: Object to the form.

23   A.   No, that's not correct when you said

24   "not perfectly correlated." If the variable is

1 correlated with the variables that are included,

2 so it does not have to be a correlation of one,

3 if the variable is correlated with what is -- if

4 there's another variable that's correlated with

5 what's included in the model, at least a part of

6 the impact of that variable will be picked up by

7 what's in the model. So it's not an all or

8 nothing that says if the correlation is one it's

9 included, and if the correlation is less than

10 one then no part of it is otherwise explained.

11 BY MR. KNAPP:

12   Q.   Well, when you say that part will be

13 picked up, that necessarily means that part will

14 not be picked up, right?

15   A.   That's correct. There --

16   MR. KO: Object to the form.

17   A.   That's correct. There may be a

18 part -- unless the correlation is one, there

19 would be a part of that variable that is not

20 picked up.

21 BY MR. KNAPP:

22   Q.   So in creating your direct regression

23 model for prior to 2010, did you consider any

24 other variables, independent variables that you

1 did not include in the direct regression?

2   A.   Undoubtedly we considered them. I

3 think in the end what limited us was the data

4 that we had, not the -- not a lack of desire to

5 have anything else.

6   Q.   What are those factors that you

7 undoubtedly considered?

8   A.   We had very lengthy consideration of

9 the so-called deaths of despair, and we tried to

10 think of -- and we looked at the previous

11 literature for any variables that people had

12 used, that researchers had used in models where

13 they tried to look at deaths of despair. So

14 that was the primary alternative that the

15 literature suggested.

16   Q.   Were there particular variables that

17 you considered that you thought might capture

18 deaths of despair that you did not include in

19 your regression?

20   A.   Nothing that we could measure that --

21 so there were no variables that we said, oh,

22 this looks like a good measure of despair but

23 let's not use it in the model.

24   Q.   What about factors that you couldn't

1 measure through data that you had?

2   A.   There are always factors that you

3 can't measure through data that you have, and

4 unfortunately they just can't be included in

5 models.

6   Q.   And to the extent that factors that

7 you don't have data for explain the increase in

8 mortality and they're not perfectly correlated

9 with the variables you didn't include, then your

10 regression model would overstate the causal

11 relationship?

12   MR. KO: Object to the form.

13   A.   Overstate implies that it would be a

14 particular direction. In general, when

15 variables are excluded from a model, there's

16 no -- you can't say without empirical evidence

17 whether it would change the included variables

18 in one direction -- it would explain it in one

19 direction or another direction, particularly

20 when you're saying that there's a component

21 which has already been, in essence, included

22 because of its correlation with other variables

23 of the model. So you're making a statement

24 about econometric results that isn't appropriate

1 there.

2 BY MR. KNAPP:

3   Q.   So just to be clear, if there are

4 variables for which you do not have data and

5 those factors are -- strike that.

6   If there are factors that have an

7 impact on mortality for which you don't have

8 data, and those factors are not perfectly

9 correlated with the variables you did include in

10 your model, then your model may overstate, may

11 understate, or may have the right result with

12 respect to the causal relationship that you're

13 drawing, right?

14   MR. KO: Object to the form. Asked

15 and answered.

16   A.   That's correct. Any variables that

17 are omitted and that are not perfectly

18 correlated with what is included in the model,

19 they could have an impact that would lead any

20 model that does not include them to either

21 overstate, understate, or be unaffected by

22 including them.

23 BY MR. KNAPP:

24   Q.   So if we look at Paragraph 88, does

1 Paragraph 88 include the demographic variables

2 that you included in your direct regression

3 model?

4   A.   Yes, it does.

5   Q.   You didn't consider any other

6 demographic variables other than what's in

7 Paragraph 88, right?

8   A.   We don't include in the model any

9 other demographic variables than what's here.

10 "Consider" implies whether we spoke about would

11 it be -- would we be able to come up with data

12 on something, and I don't want to say we didn't

13 ask whether we could come up with data on

14 anything else.

15   Q.   Okay. Then the economic variables --

16 well, strike that. Let me come back to that.

17   I think I've asked this question, but

18 I want to ask it specific in the context of

19 demographic variables. Were there any other

20 specific demographic variables that you

21 considered but did not include in your

22 regression?

23   MR. KO: Objection. Asked and

24 answered.

1   A.   I don't recall any. We also -- but we

2 did try and talk about all the variables we

3 could get, we would like to have had, so it's

4 possible that there may have been one that we

5 hunted for but couldn't find, but I do not

6 recall one in any variable in specific.

7 BY MR. KNAPP:

8   Q.   Okay. And then you also included

9 economic variables in your direct regression,

10 correct?

11   A.   That's correct. We include a number

12 of economic variables in the direct regression.

13   Q.   Are all of the economic variables you

14 included in the direct regression in

15 Paragraph 88?

16   A.   Yes, all of the variables are -- that

17 we included are in Paragraph 88.

18   Q.   Did you consider any other economic

19 variables that you did not include in your

20 direct regression model?

21   A.   We -- so I don't remember specific

22 variables that we thought, oh, I would love to

23 have this, but we don't. But it is also the

24 case that we looked around for any number of

1 economic variables. So it's possible there was

2 one that we tried to get but just were unable to

3 obtain.

4   Q.   Okay. I'm going to -- in a little bit

5 I want to walk through some variables and ask if

6 you considered them. Before we do that, I want

7 to talk about the Case and Deaton study that you

8 referenced earlier.

9   So I'm going to mark as Cutler

10 Exhibit 11 a study by Anne Case and Angus Deaton

11 called "Mortality and Morbidity in the 21st

12 Century."

13   (Whereupon, Cutler Exhibit Number 11

14   was marked for identification.)

15 BY MR. KNAPP:

16   Q.   Sir, have you -- you've seen this

17 paper before?

18   A.   Yes, I have seen this paper.

19   Q.   And did you review this paper before

20 it was published?

21   A.   I was one of the discussants of the

22 paper before it was published.

23   Q.   Sorry. I didn't catch that. You were

24 one of the what?

1   A.   Oh, discussants. This is a conference

2 where the authors present their paper and then

3 there are two individuals who are asked to

4 discussion of the paper. So I was one of the

5 people who was a formal discussant. I gave

6 official comments on the paper.

7   Q.   Okay. Bear with me one second. I

8 need to find my copy. Oh, here it is. Too many

9 papers.

10   A.   Not enough of them written by me.

11   MR. KO: At least you were a

12 discussant in this one.

13 BY MR. KNAPP:

14   Q.   All right. Let's turn to Page 444.

15 What's -- is what's included on Page 444, that's

16 a comment that you wrote about this Case and

17 Deaton article?

18   A.   As I noted, this is a conference where

19 the authors present their paper, and then there

20 are two discussants who discuss the paper and

21 then write up their thoughts, and those are

22 published along with the paper. So what begins

23 on Page 44 is my discussion of the paper.

24   Q.   Okay. And I want to start on

1   Page 445. Do you see at the top there you say,
2   "The bigger issue, however, is about why these
3   trends are occurring and what can be done to
4   reverse them. What is it about the economic,
5   social, or medical landscape that is leading to
6   the higher mortality for a very large segment of
7   the population?"
8   Do you see that?
9   A. Yes, I do see that.
10   Q. And that is one of the issues that
11   Case and Deaton were addressing in their -- in
12   this paper, right?
13   A. Yes, that is correct.
14   Q. And then you go down two paragraphs,
15   the last sentence -- the second-to-last sentence
16   says, "In their current paper, their emphasis
17   has changed. Rather than emphasizing the supply
18   of pills, they now focus on the social and
19   economic circumstances that lead people to take
20   them."
21   MR. KO: I just want to note --
22   BY MR. KNAPP:
23   Q. Do you see that?
24   MR. KO: I just want to note for the

1   record that you left off some of that statement.
2   But go ahead.
3   BY MR. KNAPP:
4   Q. Let me read it again just to make sure
5   we get it exactly right.
6   MR. KO: Thank you.
7   BY MR. KNAPP:
8   Q. It says, "In their current paper,
9   their emphasis has changed a bit. Rather than
10   emphasizing the supply of pills, they now focus
11   on the social and economic circumstances that
12   lead people to take them."
13   Do you see that?
14   A. Yes, I do see that.
15   Q. And then you go on to say, "Their
16   overall suggestion is very much in the tradition
17   of ?mile Durkheim. People despair when their
18   material and social circumstances are below what
19   they had expected."
20   Do you see that?
21   A. Yes. And, actually, just on the
22   French, it's actually ?mile.
23   Q. Thank you. I appreciate that.
24   A. He was a great --

1   Q. I'm not a French speaker.
2   A. He was a great -- I'm not a French
3   speaker either. But he was a great scholar.
4   MR. KO: From 1897.
5   BY MR. KNAPP:
6   Q. Do you agree with that, that people
7   despair when their financial and social
8   circumstances are below what they had expected?
9   A. So I'm giving this as an explanation
10   of their -- as an explanation of what they're
11   saying. I'm not an expert in psychology. If
12   you -- in general, that is what the Durkheim
13   theory is, which is that despair is a product of
14   having unmet expectations, so not -- having
15   expectations that are not fulfilled.
16   And so that's -- that is their theory,
17   that is a very, very common theory, and it's one
18   that has come up in my work, for example, on
19   youth suicide. I don't want to testify that I
20   am an expert on psychology theories. I hope
21   that distinction makes sense to you.
22   Q. It does.
23   A. Okay. Thank you.
24   Q. So the next sentence goes on -- well,

1   strike that.
2   Do you agree that despair leads people
3   to act in ways that significantly harm their
4   health?
5   A. Again, here I'm giving their
6   description which is based on Durkheim, and so
7   that's a very common view. Again, I don't want
8   to -- I don't want to pretend to be an expert in
9   psychology and to say I know all of the
10   literature that explains despair and I've read
11   all of the literature and so on. That's not an
12   expert that I am. So this is really a summary
13   of their -- of theirs for which I'm pointing out
14   the relationship with other studies in the
15   literature.
16   Q. Well, if we look at the first sentence
17   of the next paragraph, you say, "This
18   explanation is certainly correct," right?
19   A. That's correct.
20   Q. So in this comment that you wrote in
21   2017, you said that Case and Deaton's
22   explanation about despair was certainly correct,
23   right?
24   A. Yes. And by "this," I'm referring, of

1   course, to -- at least a part of it is a
2   response to that; that is, it is certainly
3   correct for some part.
4   Q.   And what Case and Deaton says is that
5   at root of this despair is economic and social
6   breakdown, right?
7   A.   That's correct. They put a lot of
8   emphasis on economic and social breakdown.
9   Q.   And when you say the explanation is
10 certainly correct, what you're referring to,
11 that the root cause of the despair is economic
12 and social breakdown, right?
13   A.   I'm not referring to all of it. I'm
14 saying that the theory that economic and social
15 breakdown leads people to despair and that they
16 then act in ways that may be harmful, for
17 example, through heavy drinking, smoking, drug
18 abuse, not taking preventive medications, and so
19 on, that that is certainly correct at least in
20 part. It's not -- I'm not making a quantitative
21 statement here about do I think that's the
22 entire explanation or what percentage of an
23 explanation do I think that is.
24   Q.   You agree that there's no way to

1   understand the mortality pattern or changes in
2   mortality without considering sources of
3   despair, right?
4   MR. KO: Object to the form.
5   A.   That is correct. One absolutely needs
6   to consider despair in looking at mortality
7   patterns.
8   BY MR. KNAPP:
9   Q.   And you agree that the source of
10 despair -- strike that.
11   You agree that the sources of despair
12 are very deep-seated indeed, right?
13   A.   Yes.
14   MR. KO: Object.
15   THE WITNESS: Oh, I'm sorry.
16   MR. KO: Go ahead.
17   Object to the form.
18   But go ahead.
19   A.   Yes, that's correct.
20 BY MR. KNAPP:
21   Q.   And in their paper Case and Deaton
22 discuss where despair may be coming from, and
23 you suspect that there may be merit in their
24 discussion there as well, right?

1   A.   Yes, that is correct.
2   Q.   All right. I want to mark as Cutler
3   Exhibit 12 a short paper called "Deaths of
4   despair redux: a response to Christopher Ruhm."
5   It's by Case and Deaton dated January 8, 2018.
6   (Whereupon, Cutler Exhibit Number 12
7   was marked for identification.)
8   BY MR. KNAPP:
9   Q.   Cutler Exhibit 12 is a response that
10 Professors Cane and Deaton wrote to --
11   A.   Case and Deaton.
12   Q.   -- Case and Deaton wrote in response
13 to a paper by Christopher Ruhm, right?
14   A.   Yes, that is correct.
15   Q.   And that's a paper by Christopher Ruhm
16 that you relied on in connection with your
17 report, right?
18   A.   Yes, that's correct.
19   Q.   And Professors Case and Deaton do not
20 agree with the conclusions that Professor Ruhm
21 drew, is that right?
22   MR. KO: Object to the form.
23   A.   It's actually a more subtle conclusion
24 than that. Professor Ruhm was saying that he

1   was going to test the hypotheses of Case and
2   Deaton by looking at what he called medium-run
3   changes in economic conditions which also
4   include social conditions, so think about it as
5   a group, by testing medium-run changes.
6   He estimated models for changes in
7   mortality similar to the models that I present
8   in this report relating mortality changes to
9   economic and social conditions, and he concluded
10 from that that economic -- changes in economic
11 and social conditions did not have a significant
12 impact on mortality due to drug use.
13   He then interpreted that as a
14 rejection of the theory that Case and Deaton put
15 forward saying that, therefore, it's not due to
16 despair.
17   What Case and Deaton are pointing out
18 in this note is two things. First they're
19 saying we had done the regressions that
20 Professor Ruhm did, and, in fact, we reached the
21 same conclusion, that we cannot explain the
22 mortality change with the economic factors that
23 Professor Ruhm looks at and we, Case and Deaton,
24 did that and we agree with that and he's

1 confirming our analysis.

2   But second they're saying the part

3 that they disagree with him is they're disputing

4 that that is a test -- is a fully accurate way

5 of testing all the theory that they're putting

6 forward. So they think that the long-run social

7 and economic conditions have an impact and not

8 just the medium-run conditions.

9   So what they're disputing is whether

10 the results of Professor Ruhm, which they agree

11 with, challenge their broader conclusion which

12 Professor Ruhm says it rejects, or whether that

13 broader hypothesis has not been adequately

14 tested by Professor Ruhm.

15   Q.   And if we turn to Page 2, final full

16 paragraph, first sentence, Case and Deaton say,

17 "This is much more" -- emphasis on much more --

18 "than economic circumstances and goes back

19 much" -- emphasis on much -- "much further than

20 1999."

21   Do you see that?

22   A.   Yes, I do see that.

23   Q.   You agree that increases in mortality

24 in the '90s and the 2000s is about much more

1 than economic circumstances and goes back much

2 further than 1999, right?

3   A.   They're putting forward a hypothesis

4 here, and their hypothesis is that despair is

5 driven by circumstances that are not just

6 medium-term circumstances, that are not just

7 economic and social and demographic change from

8 1999 to 2015, but that they're a result of a

9 lifetime of events. So that's the hypothesis

10 that they're putting forward.

11   As a hypothesis, I think that's a

12 perfectly valid hypothesis. I think that's a

13 very important and interesting hypothesis. They

14 don't have any data that says that that

15 hypothesis is true.

16   So what this is here, this is really a

17 statement of their belief about the appropriate

18 theory and why they think that Professor Ruhm's

19 characterization of his results as rejecting

20 their theory is not right. They're restating

21 their theory and that their theory is not just

22 related to results from -- to economic and

23 demographic changes from 1999 on.

24   Q.   Just like Case and Deaton, you also

1 don't have data to say whether their theory that

2 these deaths -- increase in deaths in the '90s

3 and 2000s are related to deep-seated social and

4 demographic circumstances?

5   A.   I wish I had the ability as a scholar

6 and a human being to test that. They were

7 unable to test it fully in their work. They

8 showed some correlations. They were unable to

9 test it fully in their work. I wasn't able

10 to -- I did not have access to any data they did

11 not have access to.

12   Q.   So in your regression model, you were

13 not able to control for the fact that despair

14 and deaths resulting from despair may go back

15 much further than 1999, right?

16   MR. KO: Objection to form.

17   Which regression model.

18   A.   Could you just indicate which

19 regression model you're referring to?

20 BY MR. KNAPP:

21   Q.   Stick with the direct regression.

22   A.   So I want to give two answers, which

23 is why I turned to this specific page. The -- I

24 don't have data to test many of the specific --

1 some of the specific things that one would want

2 to get at.

3   I do think that some of the variables

4 that are included in the model are likely to

5 pick up some of these long-term issues, and, in

6 fact, part of the reason for including them in

7 the model is that they would pick up some of

8 these long-term factors that may be driving

9 people's sense of themselves.

10   Q.   You would agree that it's hard to

11 control for these non-economic factors that lead

12 to despair, right?

13   A.   I wouldn't say it as hard to control

14 for non-economic factors. There are many

15 factors that are non-economic that one can

16 control for. For example, population

17 distributions are not strictly economic, they're

18 more demographic and they can be controlled for.

19   The real issue is whether there is a

20 variable that one can accurately measure, and

21 some of the variables that one would want to

22 include are not variables that we can measure

23 either at all or over any period of time.

24   Q.   So those are variables that you

1 wouldn't be able to and didn't control for in

2 your direct regression model, right?

3   A.   That is correct. And in this case I'm

4 explicitly hoping that they are correlated with

5 the variables that we included in the direct

6 model so that the effect of those variables in

7 the direct model will be picking up those other

8 characteristics that we cannot directly measure.

9   Q.   I understand that's what you're

10 hoping. But you can't say with any degree of

11 reasonable economic certainty that the variables

12 you included would pick up these other

13 non-economic variables of despair?

14   MR. KO: Object to the form.

15   A.   Without data, one can never say for

16 sure whether a variable that's not included

17 would affect the results or not, so I have no

18 way to say for sure about that.

19   I just want to make clear that you say

20 non-economic variables, that is not -- it's

21 really non-measured variables. And the

22 distinction is not between economic and

23 non-economic. Anything that we could measure

24 that either we hypothesized or other studies

1 hypothesized would be related to mortality is

2 included.

3   The only things that are not here are

4 variables that we simply could not measure

5 regardless of whether they're economic or social

6 or demographic or psychological or anything

7 else.

8 BY MR. KNAPP:

9   Q.   So let's look at -- stay with this

10 paragraph of Cutler Exhibit 12. Case and Deaton

11 say, "In our paper we talk about morbidity as

12 well as mortality, and while we recognize the

13 deterioration in wages for those without a BA,

14 we also focus on the decline in labor force

15 participation."

16   Do you see that?

17   A.   Yes, I do see that.

18   Q.   Did you control for decline in labor

19 force participation in your model?

20   A.   Actually, yes. So what we have is --

21 it's picked up in several ways. So we have the

22 change in the employment ratio, so that's the

23 share of the population that's unemployed --

24 excuse me, excuse me -- that is the share of the

1 population that's employed.

2   We also have the percentage -- the

3 change and the level in the percent of the

4 population that's unemployed. So together those

5 two will give us the labor force participation

6 rate. We decided to separate it into the

7 employed and the unemployed to allow a little

8 bit more freedom for the regression to think

9 about them differently.

10   We also have the levels of those. So

11 you can see up above we have the level of the

12 employment ratio, and we have the percent that's

13 unemployed. And then, of course, we have the

14 demographics, so anything about changes in labor

15 force related to demographics would be included

16 in there as well.

17   Q.   The next one is the decline in

18 marriage rates. Did you control for that in any

19 of your regressions?

20   A.   We -- so what they're talking about

21 are long-term declines in marriage rates, and we

22 do not have a long-term decline in marriage

23 rates in here.

24   Q.   Was the data available for the

1 long-term decline in marriage rates?

2   A.   I believe -- I would want to check

3 100 percent. I believe the reason why we didn't

4 include that would be because the long-term data

5 on marriage rates are not available at, say, at

6 the county level, but I would just want to check

7 that to be sure.

8   Q.   The next one is the rise of

9 cohabitation. Did you include a variable to

10 control for the rise of cohabitation in any of

11 your regressions?

12   A.   It's again something that we weren't

13 able to measure over a long period of time.

14   Q.   Let me go back to the decline in

15 marriage rates. Would you agree that the

16 decline in marriage rates may have an impact on

17 the increase in mortality in the '90s and the

18 2000s?

19   A.   It's a hypothesis that the decline in

20 marriage rates could have an impact on mortality

21 in the 1990s and 2000s.

22   Q.   And to the extent that it did have an

23 impact and is not correlated with the variables

24 you considered, then your regression may

1   overstate, understate, or have no effect on the

2   causal relationship that you draw?

3   MR. KO: Objection. Asked and

4   answered.

5   A.   That's correct. If it -- if it -- the

6   component of that that's not related to what's

7   included here could have an impact on the

8   regression, and it could lead the impact of the

9   shipments variable to go up, to go down, to be

10 the same.

11 BY MR. KNAPP:

12   Q.   So I have the same question about the

13 rise of cohabitation. To the extent that it has

14 an impact on mortality rates and is not

15 correlated with the variables you included, that

16 it could increase or decrease or have no effect

17 on the causal relationship that you draw in your

18 direct regression, right?

19   A.   Just qualifying that, the part of the

20 change in the cohabitation rate, that would not

21 be related. So anything about changing in

22 cohabitation that's also related to these, the

23 impact of that would be picked up.

24   So it would be other exogenous changes

1   or other non-correlated changes in the

2   cohabitation rate which may be due to different

3   reasons than the part which is related to what's

4   here. So any part that's uncorrelated with

5   what's here could have -- could have an

6   independent effect, and it could affect the

7   coefficients.

8   Q.   The next variable is the rise in

9   out-of-wedlock births. Did you control for that

10 in your -- any of your regressions?

11   A.   No. I wish we had the data to do so.

12   Q.   And to the extent that the rise in

13 out-of-wedlock births had an impact in

14 mortality, then -- that is not correlated with

15 the variables you considered, then that could

16 mean that the conclusion you draw about the

17 causal relationship between your variables is

18 either overstated, understated, or has no

19 effect?

20   MR. KO: Object to the form.

21   A.   That's correct that the -- that

22 change -- that any component of that variable

23 that is not correlated with what's included

24 could affect the coefficients here.

1   BY MR. KNAPP:

2   Q.   Next one is parents living apart from

3   children that they barely know. Did you control

4   for that factor in your -- any of your

5   regressions?

6   A.   I wish I could have controlled for

7   that factor, but no, there are no data on it.

8   Q.   And to the extent that that factor

9   impacts mortality, your regression models may

10 overstate, understate, or have no effect on the

11 causal relationships that you're drawing between

12 shipments and mortality, right?

13   MR. KO: Object to the form.

14   A.   That's correct. If the variable on

15 parents living apart from children, the part

16 which is not correlated with the variables that

17 are included here, if one were able to include

18 it, it could impact the coefficient on the

19 shipments variable. It could increase,

20 decrease, stay the same. We unfortunately don't

21 have a way to say how big the effect would be.

22 BY MR. KNAPP:

23   Q.   Decline in the quality of jobs, did

24 you control for that variable in any of your

1   regressions?

2   A.   We have many variables that are

3   associated with changes in the quality of jobs.

4   So we have, for example, the percent in

5   manufacturing in 1993 to 1995. We have the

6   change in the percent in manufacturing.

7   We also have the percent in other what

8   are called one-digit industry, agriculture,

9   mining, construction, utilities, retail

10 transportation, professional, and we have those

11 in both the levels and in the changes.

12   So we have a number of measures of

13 changes in economic opportunity that are

14 included in the model.

15   Q.   Let me go to changing religious

16 practice. Did you include a variable in any of

17 your regression models that control for changes

18 in religious practices?

19   A.   I wish I had the data to measure

20 changes in religious practices, but without that

21 data, we were not able to include it in the

22 model.

23   Q.   And to the extent that changes in

24 religious practices had an impact on mortality,

1   your regressions either overstate, understate,

2   or have no change on the impact that opioid

3   shipments had on mortality?

4   MR. KO: Object to the form.

5   A.   That's correct. If changes in

6   religious practices, the part of that which is

7   not correlated with the variables that we have

8   included, that part of it could have an effect

9   on the coefficient on shipments per capita, and

10   it could lead it to be either higher or lower or

11   it could have no impact on it.

12   BY MR. KNAPP:

13   Q.   The next one is decline of unions.

14   Did you include a variable in your direct --

15   strike that.

16   The next one is decline of unions.

17   Did you include a variable in any of your

18   regressions that controls for decline of unions?

19   A.   Several of the variables here will

20   pick up the decline in unions. So unions are

21   much more common in some industries than in

22   others. So while I did not include a direct

23   variable on the change in unionization rates,

24   which don't exist at the level detailed over

1   these time periods, we do have variables that

2   will be, I believe, reasonably closely related

3   to them.

4   Q.   All right. I want to walk through --

5   well, strike that.

6   Let me go back to the Cutler

7   Exhibit 11, which is the Case and Deaton study.

8   A.   The full study?

9   Q.   The full study, yeah.

10   A.   Not the response.

11   Q.   Look at Page 451. In the second full

12   paragraph, it says, "It is not entirely clear

13   what policy remedies are appropriate in this

14   situation, but this explanation does suggest

15   focusing a little bit more on the supply side

16   than just on the demand side."

17   Do you see that?

18   A.   Yes, I do see that.

19   Q.   And your opinions in your report are

20   that reductions in the supply side actually

21   relieve -- strike that.

22   Your opinions in this report are that

23   reductions in the supply side of licit

24   prescription opioids actually increases

1   mortality, right?

2   A.   That is correct, yes.

3   Q.   And here you were proposing that there

4   should be a focus on actually reducing the

5   supply of legal prescription opioids, right?

6   A.   Notice that what I'm saying here is

7   reducing access to legal and illegal opioid

8   drugs. So what I'm referring to here is that if

9   one just reduced access to legal drugs, then

10   people, as we know, substitute into use of

11   illegal drugs, and that an appropriate supply

12   side policy would need to focus on the totality

13   of the drugs that people are using, not just the

14   legal drugs.

15   Q.   So in your direct regression model, I

16   want to talk about other factors that you didn't

17   control for.

18   You didn't control for children,

19   correct?

20   MR. KO: Object to the form.

21   A.   We have data on the population age

22   distribution and the change in the population

23   age distribution over time. So we actually do

24   have data on the share of the population that is

1   children.

2   BY MR. KNAPP:

3   Q.   You don't control for living alone in

4   any of your regressions?

5   A.   In these regressions we do not control

6   for the share of the population that is living

7   alone.

8   Q.   And to the extent that living alone

9   has an impact on mortality, your model may

10   overstate the relationship between mortality and

11   prescription opioid shipments, right?

12   MR. KO: Object to the form.

13   A.   It may overstate or it may understate

14   the relationship between shipments and mortality

15   rates.

16   BY MR. KNAPP:

17   Q.   You don't control for veterans in any

18   of your regression model?

19   A.   No, we do not control for veterans.

20   Q.   And to the extent that veteran status

21   has an impact on mortality, your regression

22   model may overstate, understate, or have no

23   effect on the causal conclusions you're drawing?

24   MR. KO: Object to the form.

1   A.   That's correct. To the extent that
2 it's not correlated with other variables we
3 have, it could -- it could affect the
4 coefficient on the shipments variable.
5 BY MR. KNAPP:
6   Q.   You didn't control for the number of
7 doctors in your regression models?
8   A.   No, we did not control for the number
9 of doctors in the regression models.
10   Q.   And to the extent that the number of
11 doctors has an impact on mortality, the
12 conclusions you draw may be overstated,
13 understated, or have no effect?
14   MR. KO: Object to the form.
15   A.   That's correct. To the extent that
16 it's not correlated with other variables, the
17 number of doctors could have an impact on the
18 other coefficients in the model.
19 BY MR. KNAPP:
20   Q.   You didn't control for the number of
21 hospitals in any of your regression models?
22   A.   No, we did not control for the number
23 of hospitals.
24   Q.   And so to the extent that the number

1 of hospitals has an impact on mortality, the
2 conclusions you draw may be overstated,
3 understated, or have no effect, right?
4   MR. KO: Object to the form.
5   A.   That's correct. To the extent that
6 it's not perfectly correlated with the variables
7 that are included, it could lead the effect of
8 shipments to be overstated or understated.
9 BY MR. KNAPP:
10   Q.   You didn't control for eligibility for
11 Medicare Part D in any of your regression
12 models?
13   A.   We did include the population
14 distribution, so the omitted category of the
15 population is the elderly population. So the
16 population that is eligible for Medicare Part D
17 is actually included by that.
18   Q.   You didn't control for eligibility for
19 employer-sponsored health insurance in any of
20 your regression models?
21   A.   I wish I had the data to include
22 eligibility for employer-sponsored health
23 insurance. But no, we didn't have the data for
24 that.

1   Q.   To the extent that employer-sponsored
2 health insurance has an impact on mortality, the
3 conclusions you draw may be understated,
4 overstated, or have no effect?
5   MR. KO: Object to the form.
6   A.   That's correct, although in this case
7 employer-sponsored health insurance is likely to
8 be highly related to the industrial composition
9 of the workforce. So, for example, people in
10 manufacturing are much more likely to have
11 employer-sponsored health insurance than are
12 people in, for example, service industries. And
13 so I suspect that a component of that -- a
14 decent component of that would be coming through
15 the industrial composition variables that we
16 have included.
17 BY MR. KNAPP:
18   Q.   You didn't control for the incidence
19 of cancer in any of your regression models?
20   MR. KO: Object to the form.
21   A.   We did not control for the incidence
22 of cancer in the regression models.
23 BY MR. KNAPP:
24   Q.   To the extent that the incidence of

1 cancer had an impact on any of your models, the
2 conclusions you draw are either overstated,
3 understated, or have no effect, right?
4   MR. KO: Same objection.
5   A.   That's correct. If the incidence of
6 cancer changed in a way that we do not capture
7 here, that that would potentially affect the
8 coefficients. Just to note that, of course,
9 Professor Rosenthal in her report does discuss
10 issues about change in cancer.
11   But to your specific question, no, we
12 did not include it here, and any variable that's
13 not included could affect the coefficients.
14 BY MR. KNAPP:
15   Q.   If Professor Rosenthal controlled for
16 cancer in her regressions, why didn't you?
17   A.   Professor Rosenthal is looking at
18 cancer nationally, so she's doing those
19 nationally. We actually don't have data on the
20 incidence of cancer in each county, and we're
21 using county-level data here.
22   Q.   You didn't control for mental health
23 in any of your regressions?
24   A.   Unfortunately there's no consistent

1 measure of mental health. One of the banes of

2 my academic existence is that we don't know very

3 well what's happened to the mental health of the

4 population over time.

5   Q.   So to the extent that mental health

6 has an impact on the mortality that you studied,

7 your conclusions are either overstated,

8 understated, or have no impact?

9   MR. KO: Object to the form.

10   A.   To the extent that it has -- to the

11 extent that it's not correlated with the

12 variables that are included here. I believe

13 that many of the variables that are included

14 here would likely be things that would be

15 associated with changes in mental health status,

16 for example the decline of manufacturing or

17 changes in education or other things like that,

18 any part that's not associated with that could

19 then affect the results.

20 BY MR. KNAPP:

21   Q.   Just to be clear, you haven't studied

22 the part that is associated?

23   MR. KO: Object to the form.

24   A.   We have not -- I'm sorry, can you just

1 rephrase the question?

2 BY MR. KNAPP:

3   Q.   You didn't study the extent to which

4 changes in mental health are correlated with any

5 of the variables that you included in your

6 regression models, right?

7   A.   No, there's no data with which we

8 could do so.

9   Q.   You didn't control for access to

10 treatment for opioid use disorder in any of your

11 regression models?

12   A.   No, we did not control for access to

13 treatment for opioid use disorder in the models.

14   Q.   And to the extent that access to

15 treatment for opioid use disorder had an impact

16 on mortality, your conclusions may be

17 overstated, understated, or have no effect,

18 right?

19   MR. KO: Object to the form.

20   A.   In this case I think we actually can

21 say what the effect would be. So over time

22 there was greater access to opioid treatment

23 than there had been, for example, Narcan and its

24 greater availability and greater knowledge of

1 personnel about how to use it.

2   And so a number of studies have shown

3 that greater access to treatment for opioids has

4 led to reduced mortality for people with

5 opioids, and, therefore, the mortality increase

6 in the model in, for example, the indirect model

7 is smaller than would be implied just by the

8 shipments alone because there is -- because

9 fewer people are dying even given the events

10 that are occurring.

11 BY MR. KNAPP:

12   Q.   In your model you didn't control for

13 the location of where any county is located,

14 whether it was east or west of the Mississippi

15 or what region of the country it's in?

16   MR. KO: Object to the form.

17   A.   These models are estimated in changes,

18 so what we're looking at is the increase in the

19 mortality rate in different areas. We did not

20 assume that that increase would differ by areas.

21 That's a much less common assumption than if one

22 is estimating models in levels where researchers

23 sometimes include more on the geographic data.

24   But no, we did not -- we did not

1 estimate a different trend in different regions.

2 BY MR. KNAPP:

3   Q.   To the extent that geographic factors

4 had an impact on mortality that you studied,

5 your conclusions may be either overstated,

6 understated, or have no impact, right?

7   MR. KO: Object to the form.

8   A.   With this variable, with geographic

9 information, you'd want to be a little bit

10 careful. So, for example, if it -- as we were

11 talking about, there are people who move from

12 one geography to another in order to obtain

13 medicines, in order to obtain medication, either

14 legal or illegal medication. In that sense,

15 what the geographic regions would do is they

16 would say, well, within areas what's the

17 relationship between shipments and mortality.

18 That's really putting a lot of emphasis on the

19 error that comes from the transshipment within

20 the region, so, for example, people going to

21 Florida or West Virginia or Kentucky or Ohio or

22 wherever that is for their medication, to obtain

23 medications.

24   And so it's really putting a lot more

1 emphasis on that transshipment source of error.

2 And so I would be very cautious about including

3 geographic data because it may be forcing the

4 regression to use some of the variation that's

5 not -- that's more the measurement error than

6 the true signal in the data.

7 BY MR. KNAPP:

8   Q.   You didn't include any variables

9 associated with the sophistication of a drug

10 trafficking network in any of your regression

11 models, correct?

12   MR. KO: Object to the form.

13 Objection, asked and answered.

14   A.   I wish I had data on the

15 sophistication of drug networks in different

16 areas, but I don't, so I could not include it.

17 BY MR. KNAPP:

18   Q.   To the extent that the sophistication

19 of drug networks in any area had an impact on

20 mortality, the conclusions that you draw are

21 either overstated, understated, or have no

22 impact, right?

23   MR. KO: Object to the form.

24   A.   I actually don't agree with that

1 because I think that the sophistication of the

2 drug networks may be a response to people's

3 demand for opioids, in this case illegal,

4 although some drug networks might also have been

5 involved with legal opioids as well.

6   And so one would not want to include

7 in the regression a variable which is just

8 mediating, that is, the mechanism by which

9 shipments get translated into harms, because

10 that may arise endogenously from people's demand

11 driven from the misconduct on the part of the

12 defendants.

13   So I think of that as more an outcome

14 variable than I think of it as something that

15 one needs to control for in order to get precise

16 estimates here.

17 BY MR. KNAPP:

18   Q.   You didn't control for the use of

19 other types of drugs, non-opioids, in any of

20 your regression models, right?

21   A.   Again, one needs to be careful -- so

22 the answer to the specific question is no, we

23 did not. And, again, one needs to be careful

24 because of the relationship amongst the

1 different drugs.

2   So people who are using one drug may

3 then switch over to another drug as its -- as

4 the availability of the first drug changes or

5 the second drug changes, and so that in some

6 ways is an outcome, not an independent factor.

7   Q.   To the extent that use of other drugs

8 has an impact on mortality, would you agree that

9 your conclusions about the causal relationship

10 between shipments of prescription opioids and

11 mortality is either overstated, understated, or

12 has no impact?

13   MR. KO: Object to the form.

14   A.   No, I do not agree with that, because

15 in the case of that variable, one would really

16 need to do a lot more to say is the use of those

17 drugs exogenous, in which case what you're

18 saying is appropriate, or is it endogenous to,

19 for example, the variables, the shipment

20 variable. And to the extent that it's

21 endogenous to that, then it is not appropriate

22 to control for it even if controlling for it

23 would change the other coefficients in the

24 model.

1 BY MR. KNAPP:

2   Q.   You didn't cover -- strike that.

3   You didn't control for the percent of

4 the population that's covered by insurance in

5 any of your regression models?

6   A.   That's correct. That will to some

7 extent be picked up by the different industry

8 variables and, of course, the different age

9 variables as well. But we didn't have a measure

10 that we could -- we did not have a measure of

11 that that we could include directly.

12   Q.   And to the extent that the percent of

13 the population that's covered by insurance has

14 an impact on mortality, the conclusions you draw

15 about the causal relationship between opioid

16 shipments and mortality is either overstated,

17 understated, or has no impact, correct?

18   MR. KO: Object to the form.

19   A.   Only to the extent that that -- only

20 to the extent that that variable is not

21 perfectly correlated with other variables that

22 are included in the model.

23   So to the extent that insurance

24 coverage is associated with, for example,

1   manufacturing employment, which we know that it

2   is, and employment in other industries, that

3   part is picked up by the model. It's only any

4   part that would be differential -- excuse me,

5   not differential. It's only a part that would

6   be separate from that correlation that would

7   be -- that would potentially influence -- impact

8   the coefficients here.

9   BY MR. KNAPP:

10   Q.   You're not able to quantify the

11 percent of your variables that pick up the

12 percent of the population that's covered by

13 insurance and its affect on mortality, correct?

14   A.   Unfortunately, without the data, one

15 can't estimate what that is empirically.

16   Q.   You didn't include a variable for

17 exposure to trade liberalization in any of your

18 regression models?

19   MR. KO: Object to the form.

20   A.   The variables, there are studies on

21 trade liberalization and various outcomes, for

22 example, by Professor Otter at MIT and a number

23 of colleagues of his. Those tend to work

24 through the changes in the industrial

1   composition, so those are quite correlated with,

2   for example, the decline in manufacturing in the

3   area. So my belief is that that's -- is that

4   trade liberalization will show up in the impact

5   of those variables.

6   BY MR. KNAPP:

7   Q.   You haven't been able to measure that

8   yourself, correct?

9   A.   That's correct. That's my -- that's

10 my statement of how I believe it would be

11 accounted for, but I don't have data to tell you

12 for certain that that's how it's accounted for.

13   Q.   To the extent that exposure to trade

14 liberalization has an impact on mortality that

15 you studied, your conclusions about the

16 relationship between opioid shipments and

17 mortality is either overstated, understated, or

18 has no impact?

19   MR. KO: Object to the form.

20   A.   To the extent that it has an impact

21 that is -- and to the extent that there's a part

22 of it which -- part of it which is not

23 correlated with the employment change in

24 different industries, that part of it could have

1   an impact on the estimates for the other

2   coefficients.

3   MR. KNAPP: Okay. Let's take a break.

4   THE VIDEOGRAPHER: The time is

5   11:18 a.m., and we're off the record.

6   (Whereupon, a recess was taken.)

7   THE VIDEOGRAPHER: The time is

8   11:38 a.m., and we're on the record.

9   MR. KO: Do you want to go for like an

10 hour and then break for lunch? Because I forgot

11 that we started at 8:00 this morning, so maybe

12 we can do a little bit of an earlier lunch.

13   MR. KNAPP: Sure. Somebody -- if I

14 don't pick it up, just, you know, speak up.

15   MR. KO: Yeah, about an hour.

16   MR. KNAPP: Sounds good.

17   MR. KO: Okay. Thanks.

18 BY MR. KNAPP:

19   Q.   Professor Cutler, one of the variables

20 that we talked about was -- strike that.

21   One of the variables that you did not

22 include in your regression was county-level

23 cancer data, right?

24   A.   Yes, that's correct.

1   Q.   And I believe you testified that you

2   didn't believe that that data existed, right?

3   A.   What I -- what I thought you asked

4   about was county-level incidence of cancer.

5   Those data do not exist. County-level mortality

6   from cancer do exist.

7   Q.   And if you had had data on incidence

8   of cancer, that's something that you would have

9   wanted to factor into your model, right?

10   MR. KO: Object to the form.

11   A.   If I had had data on county-level

12 incidence of cancer, I would have wanted to

13 factor that in.

14   Can I just explain one, I think, poor

15 wording choice that I made? Which is, I said in

16 response to several of your questions I wish I

17 had the data. That was me talking as an

18 academic saying I wish the data existed.

19   So for every time I said I wish I had

20 the data, I did not mean to imply that the data

21 are there and someone was withholding it from

22 me. What I was saying was the data are not

23 there. And in terms of doing academic work and

24 understanding more about the world, I consider

1   it unfortunate that the world doesn't have it.
2   But I just want -- I don't want there
3   to be a misconception that the data exists and I
4   purposely was prohibited from using it.
5   BY MR. KNAPP:
6   Q. Professor Cutler, do you know how the
7   incidence of cancer in Ohio compares to the
8   incidence of cancer nationally?
9   A. I do not know how the incidence of
10   cancer in Ohio compares to the incidence of
11   cancer nationally.
12   Q. All right. I'm going to -- I'm
13   handing you a tablet right now that has a report
14   that we ran from a website called
15   statecancerprofiles.cancer.gov.
16   MR. KO: I'm sorry, who ran it?
17   MR. KNAPP: It's a website. It's just
18   a website that we -- you can put some inputs
19   into, and it will spit out the incidence of
20   cancer throughout the country.
21   BY MR. KNAPP:
22   Q. I'm going to hand this to you. And
23   you can see a map that has the incidence of
24   cancer by county, right?

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1   A. Yes. I do see that map, yes.
2   Q. And it has data for 2011 through 2015,
3   right?
4   A. Yes, that's correct.
5   Q. And you can see from that map that the
6   incidence of cancer in Ohio is on the high end
7   of the incidence of cancer nationally, right?
8   A. There are more red areas in Ohio than
9   there are -- it's preponderantly towards the
10   orange and the red, that's correct.
11   Q. And to be clear, you didn't include
12   this county-level cancer data in your regression
13   models?
14   A. These data are from 2011 to 2015, so
15   we needed data that were over the whole time
16   period.
17   Q. Had you accessed this website before,
18   Professor Cutler?
19   A. I have -- yes, I have used cancer.gov
20   and state cancer profiles.
21   Q. And can you state for certain sitting
22   here today that this county-level cancer data
23   for Ohio and nationally was not available for
24   years prior to 2011?

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1   A. No. I had thought it wasn't, but I
2   may be -- I may have been incorrect on that.
3   I also -- I think of the variables you
4   listed, the cancer incidence rate is one that I
5   would have expected would have a smaller -- a
6   negligible impact; that is, the people who are
7   using opioids for treatment of cancer pain are
8   probably not associated with the mortality of
9   opioids in the overall population, and it's a
10   fairly confined population. So my guess is that
11   that would not -- that's not a variable that I
12   would ex ante guess would have a very big impact
13   on any of the other variables in the model.
14   Q. Just to be clear, you haven't done any
15   quantitative analysis to support that conclusion
16   you just stated about cancer, correct?
17   A. That's correct. I was giving you a
18   conceptual theoretical statement about it as
19   opposed to an empirical statement.
20   Q. Now, in your regression models you say
21   the ideal situation would have been if you could
22   have used consumption data, right?
23   MR. KO: Object to the form.
24   Which regression models?

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1   BY MR. KNAPP:
2   Q. In all of your regression models,
3   correct, sir?
4   A. In the direct models that use the
5   shipments per day, the ideal variable to use
6   would have been consumption of opioids per
7   capita -- excuse me, per capita.
8   Q. And you would agree that some pills
9   that are shipped into a county are not consumed
10   because they're destroyed, right?
11   A. That's correct. That is one of the
12   reasons why pills shipped will differ from
13   consumption, is that the pills might not be
14   taken. That's one reason.
15   Q. Did you investigate what percentage of
16   pills that are shipped are actually consumed?
17   A. No. I don't know of county-level data
18   that would provide information over different
19   points in time on the share of pills that were,
20   let's say, received by individuals were actually
21   consumed.
22   Q. And you don't have any data about the
23   percentage of pills that were shipped to
24   Cuyahoga or Summit that were actually consumed?

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1           MR. KO:  Object to the form.  And
2  objection, asked and answered.
3           Go ahead.
4      A.   No, I don't have that data for
5  Cuyahoga and Summit.  And as we were talking
6  about, that adds to the measurement error in the
7  model.  And so that source of measurement error
8  would drive the coefficient down; that is, it
9  would estimate a smaller impact of shipments on
10  deaths than is true in the world because of the
11  measurement error.
12  BY MR. KNAPP:
13      Q.   And if you apply that on a
14  county-by-county basis, would the impact in a
15  particular county depend upon whether there's
16  more or less than the average pills that are
17  destroyed as opposed to being consumed?
18           MR. KO:  Object to the form.
19      A.   In each county the relationship
20  between the shipments of opioids and the
21  consumption of opioids based on the part which
22  is pills picked up but not consumed, that could
23  very well differ across counties, and that is
24  again a source of measurement error; that is,
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1  that's why -- one of the reasons why pills
2  shipped is not perfectly correlated with the
3  consumption.
4           And as a result of that, if that's
5  random measurement error, then that will lead to
6  an estimate that is too low; that is, it will
7  understate the impact of the misconduct of the
8  defendants on the harms.
9  BY MR. KNAPP:
10      Q.   In order to have consumption of a
11  prescription opioid, first a doctor needs to
12  write a prescription, right?
13      A.   I believe that some pills are stolen.
14  I'm not an expert on this.  So I don't know that
15  every single pill that's taken came because of a
16  doctor's prescription.
17           For a legal use, yes, one would need a
18  doctor's prescription.
19      Q.   Would your analysis that shows that
20  increase in mortality is correlated with
21  increases in shipments of prescription opioids,
22  would that relationship apply equally to
23  prescriptions that were written for prescription
24  opioids?
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1           MR. KO:  Object to the form.
2      A.   I don't know -- so you're asking an
3  empirical statement as to whether this
4  regression would give the same result if one
5  used prescriptions.
6           There are not data on prescriptions
7  that can be used to test this.  The -- my sense
8  as a model builder is that the MME measure is
9  likely preferred -- for this analysis the MME
10  measure is likely preferred to a number of
11  prescriptions because, for example,
12  prescriptions differ in the number of days and
13  in the dosing or in the amount of the molecule,
14  and the harms are more likely related to the
15  MMEs than they are to just the presence of a
16  prescription, say, that was filled.
17           So I don't have an empirical answer,
18  but I think an MME measure makes more sense
19  theoretically to include than a prescription
20  measure.
21  BY MR. KNAPP:
22      Q.   Just to be clear, you didn't study the
23  impact on mortality that doctors' prescriptions
24  had at any point in time, correct?
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1      A.   To the extent that the shipments that
2  we're picking up here are a result of doctors'
3  prescriptions, then they are, in fact, here,
4  so -- as opposed to other ways of obtaining
5  MMEs, either stolen or through borrowing from
6  friends or family.  So this is a summary of all
7  the prescriptions sort of weighted up in terms
8  of the MMEs that were shipped.
9      Q.   But to be clear, in your model you
10  don't attribute any of the harms associated with
11  the shipments to the doctors that actually wrote
12  the prescriptions, right?
13           MR. KO:  Objection.  Asked and
14  answered.
15      A.   This model is not designed to say how
16  much of this shipment is a result of different
17  factors.  This is designed to give the effect of
18  the shipments on mortality.  That's then used in
19  conjunction with Professor Rosenthal's estimates
20  to say what is the impact of the misconduct of
21  the defendants.
22           So anything about misconduct of a
23  particular person or organization would show up
24  in the input from Professor Rosenthal, and I
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1   would not want to -- it wouldn't make economic

2   sense to include them in this model.

3   BY MR. KNAPP:

4   Q.   So let's look at Paragraph 82. It

5   says you looked at the change in mortality from

6   1993 to 1995 compared to 2009 to 2010. Why did

7   you select a three-year period on the front end

8   and a two-year period on the back end?

9   A.   The three-year period -- so the reason

10 for including more than one year is because

11 there are random fluctuations in mortality rates

12 in one year as opposed to another year, and

13 averaging over more years smooths those out

14 more. So that's why we should do that.

15   The choice of the years 1993 to 1995

16 is a result of the fact that we wanted to get

17 mortality in years before the opioid epidemic,

18 and so 1995 is -- the latter parts of 1995 are,

19 of course, when OxyContin is approved. And so,

20 therefore, these are years where up to -- right

21 up to that point. And three years is a -- just

22 a natural averaging over that reduces the

23 fluctuation sufficiently without going too far

24 into the history.

1   On the later end, the averaging -- so

2   there's not a scientific criteria. There's not

3   a test statistic that one could use to determine

4   which years you should average over. I wanted

5   to end in 2010 for the reasons that we've spoken

6   about having to do with the transition from

7   legal opioid deaths to illegal opioid deaths.

8   I didn't want to go too far back

9   because then you're missing, of course -- you're

10 sort of averaging in years where there's a

11 smaller effect, and one doesn't want -- where

12 the effects are still ongoing and building up,

13 and one doesn't want to do that.

14   So two years seemed like it was a

15 natural compromise between doing just one year,

16 which exposes one to the random fluctuations in

17 coding and just other random causes, and going

18 back many more years which would cut out some of

19 the impact one wishes to measure.

20   Q.   Did you run the model with more years

21 on the back end, for example, 2008 to 2010?

22   A.   I don't know that we did. I don't

23 recall having run the model with different years

24 on the back end.

1   Q.   If you look at Paragraph 90, you agree

2   that the relationship between opioid shipments

3   and mortality may vary across areas, right?

4   A.   For example, in more or less populated

5   areas, that is an example of how it may vary

6   across areas, correct.

7   Q.   And you estimate that the impact --

8   well, strike that.

9   In running your regression you

10 estimate the impact on mortality using the

11 national average of 1997 to 2010, average

12 shipments across the regression sample, right?

13   A.   That is correct. It is the average

14 shipments from 1997 up through 2010.

15   Q.   And how different is the national

16 average than the figures for Summit and

17 Cuyahoga?

18   A.   My recollection, although it's not in

19 the paper so -- excuse me, it's not in the

20 report so I don't want to state this with

21 100 percent certainty, my recollection is that

22 Cuyahoga and Summit are near the average. And I

23 think, if I recall correctly, they're within the

24 50 percent that's neither the bottom shipments

1   nor the top shipments. But I don't recall

2   that -- I don't want to say for certain because

3   I don't see the specific figure here.

4   Q.   In applying the national averages to

5   data for Cuyahoga and Summit, did you make any

6   adjustments for the variation of the figures for

7   Cuyahoga and Summit from the national average?

8   MR. KO: Object to the form.

9   A.   Can you rephrase the question?

10 BY MR. KNAPP:

11   Q.   When you applied your percentage of

12 harm attributable to shipments to harms in

13 Cuyahoga and Summit, did you make any

14 adjustments for the differences between the

15 national average and Cuyahoga and Summit?

16   MR. KO: Same objection.

17   A.   When we estimated the percentage of

18 harms that results from shipments, there was

19 no -- we used the predictions from the model, so

20 we did not do any ex post adjustments across

21 different counties, which one wouldn't want to

22 do without a valid theoretical reason for doing

23 why.

24   They're then, of course, applied to

1 the data on crime, child services, medical

2 examiner data, law enforcement data from those

3 specific counties. So the estimates that I

4 reach at the end are based on data from specific

5 counties. They're not based on just the

6 national average.

7 BY MR. KNAPP:

8   Q.   The shipment coefficient that you

9 apply in calculating the impact on mortality is

10 a national statistic, correct?

11   A.   That is one statistic that applies

12 given the variation in the data in all of the

13 large counties that are involved in the

14 analysis.

15   Q.   And you didn't make any adjustments to

16 that shipment coefficient considering that you

17 were going to apply this data just to Summit and

18 Cuyahoga?

19   A.   One has to estimate it across a sample

20 of areas. So all of the adjustments associated

21 with then applying it to Cuyahoga and Summit

22 come in the form of controlling for these other

23 factors. These other factors absolutely vary

24 across areas, and they clearly -- they explain a

1 large part of the variation in mortality changes

2 across areas. So in that sense we're

3 controlling for differences in Cuyahoga and

4 Summit relative to the rest of the nation.

5   But the specific shipments variable,

6 there's -- we have no way to see whether that

7 number would be different in one or two

8 particular counties relative to the rest of the

9 counties. There's no econometric way one could

10 estimate whether that coefficient is different

11 for just those two counties. You'd need a

12 different type of model entirely in order to

13 estimate a coefficient for a single county. You

14 can't do it with just one observation for a

15 county, or even a group of two counties. You

16 couldn't do it.

17   Q.   All right. Let's look at Table 3.10

18 on 64. And I just want to make sure my

19 understanding of these columns is correct, so

20 hopefully these will be relatively simple

21 questions.

22   Column A reports actual mortality for

23 all the counties in your sample, right?

24   A.   That is correct, column A is the

1 actual mortality rate.

2   Q.   And column B reports the actual

3 shipments for all counties -- excuse me, strike

4 that.

5   Column B reports actual shipments for

6 all counties in your sample, right, the

7 cumulative average?

8   A.   That is correct, column B is the

9 cumulative average shipment for the counties in

10 the sample.

11   Q.   And then we talked about this, but

12 column D is the shipment coefficient for all of

13 the counties in your sample, right?

14   A.   That's correct. That is the -- that's

15 not quite phrased the exact way I would phrase

16 it. That is the shipment coefficient from the

17 regression model that uses cross-county data, so

18 it is the shipment coefficient from the model.

19   Q.   But it's not as if there's a different

20 shipment coefficient for different counties

21 included in your sample?

22   A.   No.

23   MR. KO: Object to the form.

24   A.   No. As I said, it would not be

1 possible given just one observation per county

2 to have a different -- it's econometrically

3 impossible to have a different coefficient for

4 each county.

5 BY MR. KNAPP:

6   Q.   Did you test whether the impacts that

7 you estimated based upon all the counties in

8 your sample lead to unexpected results in any

9 particular county?

10   MR. KO: Object to the form.

11   A.   A general thing that one does in

12 looking at regression analysis is often to look

13 at the specific observations and then to see how

14 well the regression fits the observations.

15   To the extent that there are outliers

16 in that, that is, a particular county is way off

17 the regression line, one then often either

18 adjusts the model or sometimes decides to

19 eliminate an observation entirely because it may

20 not be relevant.

21   In this case, as we spoke about

22 earlier, there were four counties that they're

23 not so far off the line but the shipments were

24 so high that it seemed clear that they -- and

1   they were from areas where cross-county

2   transshipment was reported by press and others

3   to be big, that they seemed so high that I felt

4   more comfortable using the vast bulk of the

5   other data, the 400 out of 404 other data that

6   did not have any concerns about those issues in

7   those four counties.

8   BY MR. KNAPP:

9   Q.   So let me just pick up on something

10 that you said. You said you looked at press

11 articles about high rates of transshipments.

12 What press articles did you look at that

13 referenced high rates of transshipments into or

14 out of Franklin County, Ohio?

15   A.   I don't think there were any that

16 specifically mentioned Franklin County, Ohio.

17 There are articles and books that have spoken

18 about transshipments from, for example, Florida,

19 from West Virginia, from Kentucky, from Ohio.

20   And so because the counties with the

21 very high shipments tended to be in states in

22 general where transshipments were reported to be

23 an issue, I thought it -- I thought it more -- a

24 more convincing analysis to eliminate those four

1   observations as being very different on

2   the shipment variable.

3   Q.   Did you consider whether it's possible

4   that your regression model would attribute

5   greater than 100 percent impact on mortality

6   when applied to any single county?

7   MR. KO: Object to the form.

8   Which regression model?

9   A.   It's -- so, in general, one does look

10 for things like that. But the issue is there

11 are always, of course, points that are off the

12 line, so there are always outlier observations.

13   There may be observations for which

14 there was a particularly high level of shipments

15 relative to population not in those four, or for

16 which other factors imply an increase in

17 mortality where the prediction as a whole could

18 very well lead to an estimate of over

19 100 percent or any other type of issue.

20   That's why as an econometrician you

21 wouldn't use the analysis of this to predict for

22 a single county, but rather one wants to use

23 this to develop an estimate for the set of

24 counties as a whole because that's what this --

1   this is what is describing the vast -- the

2   average county in the data set, and that's what

3   that regression coefficient is giving, and,

4   therefore, it's appropriate to evaluate it at

5   the average in the data set.

6   BY MR. KNAPP:

7   Q.   You would agree that shipments of

8   prescription opioids can't have more than

9   100 percent impact on mortality, right?

10   A.   Of course, the question is 100 percent

11 relative to what? It is possible that there

12 could be fewer deaths than would be predicted by

13 a model. For example, if a county were

14 particularly good at treat -- if a county got to

15 be particularly good at treating people who had

16 opioid overdoses, then the actual mortality rate

17 would be lower than would be predicted on the

18 basis of shipments because the county was

19 successfully able to prevent death that results

20 from opioid use.

21   Q.   So it's your testimony that if there's

22 a greater than 100 percent impact on mortality

23 for any given county that that can be explained

24 by shipments into that county?

1   A.   I'm not saying that that's -- I'm not

2   saying that that is the explanation. I'm making

3   two points. The first point is that it is, of

4   course, theoretically possible that a county

5   could be estimated to have more deaths than it

6   actually does because the county does a good job

7   at preventing deaths, so preventing actual

8   deaths relative to -- relative to what would be

9   predicted. So that county is not -- in that

10 eventually, in that hypothetical, that county

11 would have predicted deaths greater than actual

12 deaths, and that would be a perfectly correct

13 statement -- conclusion to draw.

14   And, second, I'm making -- so that's

15 the first point to make. And then the second

16 point to make is that using a regression

17 coefficient to then predict and look at a single

18 county is generally not what an applied

19 economist does, because a single county may have

20 an outlier for a particular reason in a

21 particular year. And the regression says yes,

22 given all the outliers, here is the nature of

23 the data, here is what I -- here's what's true

24 about the data as a whole, but that doesn't --

1 but it doesn't erase what may be an outlier for

2 any number of reasons in a county.

3   And so it's just not -- this is not

4 the methodology you'd use if you wanted to

5 understand that single county. You would sort

6 of almost do an exact time series of that

7 specific county, and you'd use a very different

8 methodology.

9   So just as a -- so the second point is

10 as a general matter, I wouldn't apply this to a

11 single county and say, oh, okay, that's the

12 obvious way to do it. Instead I would do what

13 we did here and what most econometricians would

14 do, which is to apply it to the sample as a

15 whole.

16   Q.   Okay. Let's look at Paragraph 109.

17 So now Paragraph 109, we're looking at your

18 application of the direct model to the period --

19 to elicit mortality in the period 2011 to 2016,

20 right?

21   A.   Yes, that is correct.

22   Q.   Why did you conclude that it was

23 reasonable to assume that the relationship

24 between opioid shipments and deaths prior to

1 2010 could be applied to licit opioid deaths the

2 post-2010 period when you've concluded that the

3 relationship between shipments and mortality

4 changed after 2010?

5   MR. KO: Object to the form.

6   A.   I think of the estimates that we have

7 from the direct model from the mid 1990s

8 through 2010 as being, if you will, a form of

9 structural analysis, so it's a truth about the

10 world, which is that shipments of legal opioids

11 lead to this level of mortality.

12   To the extent that that's then a truth

13 about the world, it can then be run forward into

14 years post 2010, so that's the -- that's the --

15 the reasonableness is my sense that it's a true

16 structural relationship.

17 BY MR. KNAPP:

18   Q.   And did that -- the structural

19 relationship between shipments and mortality

20 actually changed after 2010, correct?

21   A.   That part is particularly involving

22 the use of illegal opioids. What this is saying

23 is given what I observed in the period up to

24 2010, what would I have forecast for the deaths

1 due to legal opioids after 2010 in light of the

2 shipments. And so that's exactly why we broke

3 it into two parts, the legal component and the

4 illegal component, for exactly that reason.

5   Q.   Okay. So let's turn to Table I.2 in

6 Appendix 3.1, share of harms due to all

7 shipments.

8   A.   I'm sorry, Table I.2?

9   Q.   I.2.

10   MR. KO: Are you in Appendix 3?

11   MR. KNAPP: 3.1.

12   A.   I'm sorry. Let me just make sure I

13 have the correct appendix. I'm sorry.

14 BY MR. KNAPP:

15   Q.   I think you've got it.

16   A.   Appendix 3.I.

17   Q.   Oh, is that 3.I?

18   A.   Yes.

19   Q.   III.I. Thank you.

20   A.   The appendices are delineated by

21 letters, so...

22   Q.   I was going to say it didn't make

23 sense to me that it would be 3.1, but --

24   A.   I thought for a minute I was missing

1 out on something so --

2   Q.   Okay.

3   A.   So --

4   Q.   Glad we're on the same page.

5   A.   So there we are.

6   Q.   Okay. So when you -- after you ran

7 your regression and you come up with your

8 shipment coefficient, you calculate the percent

9 impact on mortality. And the question that I

10 have is, in column B of Table I.2, why did you

11 use the cumulative average shipments?

12   A.   The regression model that we

13 estimated, it relates mortality changes to

14 cumulative average shipments, and, as I said, I

15 interpret that as a structural estimate; that

16 is, that is the true relationship.

17   Therefore, to continue that forward, I

18 need to continue that true relationship, and

19 that true relationship is with the cumulative

20 average shipments. So, therefore, I use the

21 cumulative average shipments going forward.

22   Q.   Why did you use a cumulative average

23 as opposed to just cumulative shipments?

24   A.   The cumulative average shipments is

1   just dividing by the number of years. So in the

2   regression, it would not have affected things at

3   all; that is, the estimates would have been that

4   the R-squared of the model would have been

5   exactly the same. The coefficients on all the

6   variables other than the shipments would have

7   been the same. And the shipments variables

8   would just be, you know, 13 times smaller; that

9   is, that's what the cumulative is, is it's 13

10   times bigger, so the average would be -- so,

11   therefore, the coefficient estimate would be 13

12   times smaller. So it would give exactly the

13   same -- the same predictions there. I thought

14   that -- so it wouldn't affect the regressions.

15   But, in general, you don't want to

16   have a model that sort of explodes. So if it

17   were cumulative shipments, then that implies

18   that at some indefinite point in the future

19   mortality rates would exceed the entire

20   population because the cumulative keeps growing,

21   and that's clearly not a good feature of a

22   model, so the average makes more conceptual

23   sense.

24   Q.   So agree with you on the shipment

1   coefficient for 2010. But let me ask you about

2   for years prior to that.

3   In the cumulative average shipments

4   for 2009, 2008, 2007, and 2006, do you know if

5   you're dividing by the same number of years that

6   you divide for in 2010?

7   MR. KO: Are you looking at Table I.1?

8   MR. KNAPP: Now I'm looking at Table

9   I.1. Thanks.

10   A.   I believe we're dividing by the

11   cumulative average shipments up to that point,

12   which is what one would want to do.

13   BY MR. KNAPP:

14   Q.   So, for example, in 2009, you're

15   dividing by the total number of years between

16   1997 and 2009, so it would be divided by, I

17   believe -- is that 13?

18   A.   12 years.

19   Q.   It would be 12 years, so 2010 divided

20   by 13?

21   A.   Whatever, maybe 13.

22   Q.   Yeah. It depends upon how you count

23   the first year, I think.

24   A.   Correct.

1   MR. KO: Or the last.

2   MR. KNAPP: Or the last, correct.

3   Thank you.

4   BY MR. KNAPP:

5   Q.   Do you know if you're dividing by

6   13 years in 2009 and 13 years in 2008, or are

7   you dividing by increasingly less years as the

8   years go back from 2010 to 2006?

9   A.   I'd want to look at the -- so I don't

10   know offhand. I'd want to look at the actual

11   spreadsheet to give you a definitive answer.

12   Q.   Do you know if there -- what is --

13   strike that.

14   Do you have a view on what is the

15   right approach in order to maintain consistency

16   between the cumulative average shipments that

17   are reported prior to 2010 and the shipment

18   coefficient that you apply for all years 2010

19   and prior?

20   A.   One would want to measure the

21   cumulative average shipments using the number of

22   years included in the average, so that -- so in

23   2006 it should be a different number of years

24   than in 2010.

1   Q.   And so your view is that you wouldn't

2   change the shipment coefficient for the prior

3   years to reflect the decreased number of years

4   that you're reflecting in the sample?

5   A.   No.

6   MR. KO: Object to the form.

7   A.   No, you wouldn't change the shipment

8   coefficient because the shipment coefficient is

9   sort of a structural estimate of how cumulative

10   shipments up to that point -- cumulative average

11   shipments up to that point affect mortality up

12   to that point.

13   So I'm treating that as a structural

14   parameter; that is, that coefficient is true,

15   and it's true about the world in different

16   periods of time -- I should say over the whole

17   time period.

18   BY MR. KNAPP:

19   Q.   Okay. So let's go back into Table

20   I.2. So I want to imagine a world where actual

21   shipments into a county after 2011 dropped to

22   zero, and they stay at zero from 2011 to 2012.

23   Okay?

24   A.   Okay.

1   Q.   Would your model still predict that
2 shipments in a year where there aren't actually
3 any shipments have an impact on mortality?
4   A.   The model uses the cumulative average
5 shipments, so that the past shipments still have
6 an impact on individuals, and that's directly
7 because of the addiction-related component.
8   So the individuals who took the
9 medications earlier when there were shipments,
10 then become addicted and, therefore, there's
11 still an impact on mortality even after
12 shipments, for example, fall.
13   Q.   But here in Table I.2 we're just
14 looking at licit mortality. How is it possible
15 that there would be deaths from licit opioids in
16 this hypothetical we've constructed where
17 there's no licit opioid shipments?
18   MR. KO: Object to the form.
19   A.   So I'm going to give two answers to
20 you. The first answer is that, of course, some
21 individuals obtain opioids outside of their
22 county, and so, therefore, there will be some --
23 there will be some opioid use associated with
24 that, so that's the first, and some

1 opioid-related deaths associated with that.
2   The second point which I think is
3 probably more fundamental is you're asking a
4 question here that's far, far out of sample. So
5 there are no counties in the data where
6 shipments went from a high number to zero. So
7 as a result, it's often difficult in econometric
8 circumstances to use a result that's estimated
9 within a sample to forecast very far out of
10 sample.
11   So to give you an analogy, if you
12 estimated the relationship between -- well, I'm
13 not sure if I can come up with one.
14   Let's say if you estimated the
15 relationship between a person's weight and their
16 consumption of a particular food item, or their
17 death and the consumption of a particular food
18 item, and then you said now suppose that that
19 individual consumed that food item 24 hours a
20 day, seven days a week continuously, what age
21 would they die at, your model can give you an
22 estimate, but that is so far out of the range of
23 the data that you observe that you wouldn't
24 trust that model even though it can give you an

1 estimate.
2   So I think the hypothetical that
3 you're asking about here is so far out of the
4 range of the data that it's almost not the right
5 model, because we just never observe anything
6 that looks like that in the data.
7 BY MR. KNAPP:
8   Q.   So if we look at Table I.2, do you see
9 that the impact on mortality for licit opioids
10 is increasing from 2011 to 2016? Do you see
11 that?
12   A.   Yes, I do see that.
13   Q.   And this is happening at a period
14 where shipments into the counties -- strike
15 that.
16   This is happening at a period where
17 overall shipments of licit prescription opioids
18 are going down, right?
19   A.   Yes, I do see that.
20   Q.   And this is happening at a period
21 where, according to your theory, folks who are
22 addicted to prescription opioids were
23 substituting into illegal opioids, right?
24   A.   Yes, that is correct.

1   Q.   Given that framework in the post-2010
2 period, to what do you attribute the increasing
3 impact on mortality for licit opioids?
4   A.   There are several factors that could
5 explain that, the increasing. So first off,
6 what I want you to note is that the coefficients
7 in -- excuse me, the percentages in column I,
8 they're rising. They're all, of course, less
9 than 100 percent; that is, the model is not
10 predicting more deaths than occur.
11   What's -- what the -- what's happening
12 here is that -- one way this could occur -- let
13 me say I don't have evidence, but one way this
14 could occur is a lot of the reduction in
15 prescription of -- in shipments of opioids are
16 for people who are taking, for example, small
17 quantities.
18   So you have -- you know, you can think
19 about people who are addicted to opioids and are
20 taking large amounts and then people taking
21 smaller amounts. This could very well occur if
22 the bigger reduction is among the people who are
23 taking smaller amounts, but then the harms are,
24 of course, among those who are taking larger

1   amounts, and then those larger amounts would be

2   associated with a higher percentage of the

3   mortality impact.

4   Q.   So what percentage of the population

5   that you claim was addicted to prescription

6   opioids substituted into illegal opioids versus

7   fall into this bucket of people using what you

8   speculated was larger amounts of opioids in the

9   post-2010 -- of prescription opioids in the

10   post-2010 period?

11   MR. KO: Object to the form.

12   A.   I don't have epidemiological data to

13   answer that.

14   I also want to point out that,

15   remember, these are deaths due to use only of

16   legal opioids. So someone who is using legal

17   opioids and also illicit opioids, illegal

18   opioids, would be included in the next set of

19   tables there.

20   I think the reason why I made that

21   point is some of what you're asking about is

22   people who are switching back and forth, and

23   that switch may not be complete, and an

24   individual may be using both legal and illegal

1   opioids, in which case you'd really need to be

2   looking at the illegal opioid components right

3   alongside the legal, the licit opioid deaths.

4   BY MR. KNAPP:

5   Q.   But the mortalities that are reflected

6   in Table I.2 after 2010 would have to be people

7   that did not fit your theory of substituting

8   from prescription opioids to illegal opioids,

9   right?

10   MR. KO: Object.

11   BY MR. KNAPP:

12   Q.   These are deaths only resulting from

13   licit opioids?

14   MR. KO: Object to the form.

15   A.   These are deaths for which the --

16   correct, for which the cause of death is only

17   legal opioids.

18   BY MR. KNAPP:

19   Q.   And do you have any quantitative

20   explanation -- I know you've speculated and you

21   said you don't have evidence for it, but do you

22   have any quantitative explanation for why the

23   impact on mortality is increasing after 2010 for

24   licit prescription opioids when licit

1   prescription opioid shipments are going down?

2   MR. KO: Object to the form.

3   Objection, mischaracterization of previous

4   testimony.

5   A.   The -- I do not have -- in order to

6   answer that question specifically one would need

7   a detailed epidemiological model. I have not

8   developed a detailed epidemiological model here,

9   so I can't answer that specifically.

10   There are certain hypotheses in which

11   this would make sense, but I don't have an

12   empirical analysis that says here's how to

13   answer your question exactly, here's a

14   quantitative answer to your question.

15   MR. KNAPP: Do you want to break for

16   lunch now? I don't know. Have we been going

17   about an hour? I'm moving to a different topic.

18   MR. KO: Is it like ten minutes? I'm

19   fine with --

20   MR. KNAPP: It's not ten minutes.

21   MR. KO: Two minutes?

22   MR. KNAPP: It's not two minutes.

23   Why don't we break for lunch.

24   THE VIDEOGRAPHER: The time is

1   12:27 p.m., and we're off the record.

2   (Whereupon, a luncheon recess was

3   taken.)

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1   AFTERNOON SESSION

2

3   THE VIDEOGRAPHER: The time is

4   1:06 p.m., and we're on the record.

5   BY MR. KNAPP:

6   Q.   Professor Cutler, for your regression

7   of the relationship between shipments and

8   mortality for the period 2011 to 2016, in your

9   approach 1 you used an indirect regression

10 model, right?

11   A.   Yes, that's correct. The approach 1

12 used an indirect regression model to estimate

13 over that time period.

14   Q.   And if we look at Paragraph 96 of your

15 report, your model produced an R-squared of .31,

16 right?

17   A.   Yes, that is correct.

18   Q.   And so about 69 percent of the

19 variance between counties was not predicted by

20 variables in your model, right?

21   MR. KO: Objection to the form.

22 Object to the extent it mischaracterizes the

23 report.

24   A.   Actually, while that's accurate, what

1   I'd like to note is that in that model, in a

2   cross-section model like that, an R-squared of

3   31 percent is really quite high. So that's much

4   higher than many estimates of cross-section

5   mortality rates get as an R-squared.

6   And similarly, the R-squared of

7   57 percent in the direct model is extremely high

8   and is much higher than most estimates in a

9   cross-section regression get.

10   So I interpreted the R-squared

11 estimates from the indirect model as -- from the

12 direct model as both being indicators that the

13 models fit extremely well.

14 BY MR. KNAPP:

15   Q.   You don't know what caused the

16 60 percent of variation in your indirect model

17 that's not explained by the variables in your

18 regression, correct?

19   A.   That's correct. It's not explained by

20 the variables in the regression. Some of it is

21 just true randomness; that is, there's just

22 different mortality rates, perhaps a particular

23 county was better or worse at saving individuals

24 who had opioid overdoses, perhaps the

1   relationship between -- in the direct model

2   opioid shipments is not obviously saying who

3   gets the shipments. These estimates don't say,

4   you know -- I don't have within county variation

5   in terms of exactly where people are living and

6   so on. So actually you would never, ever expect

7   a cross-section model like this to give an

8   R-squared near 1, you just never see that.

9   And the 31 percent here, as again just

10 mentioned the 57 percent, both of those numbers

11 are actually quite high.

12   Q.   And in your indirect model, what you

13 do is you attribute to defendants all of the

14 mortality, the mortality from illegal opioids

15 that cannot be explained by the variables in

16 your indirect model, correct?

17   A.   That's not correct. It attributes to

18 the shipments of medication all the effects that

19 cannot be attributed to those characteristics.

20 It then takes out -- it then uses that to --

21 with the percentage of the shipments due to

22 misconduct on the part of the defendants, that

23 is incorporated there as well.

24   Q.   And that's a good clarification.

1   So you attribute all of the

2   unexplained variation in your indirect model to

3   shipments, not defendants' misconduct?

4   A.   That is correct, it is attributed to

5   the shipments, not to the defendants'

6   misconduct.

7   Q.   And if we look at footnote 53 on

8   Page 45 of your report, the second sentence

9   says -- let's read the whole thing -- it says,

10 "The indirect regression attributes the entirety

11 of unexplained opioid-related mortality to

12 shipments. To the extent that other factors not

13 modelled in the baseline regression contributed

14 to increases in opioid mortality, the indirect

15 approach has the potential to overstate the

16 impact of defendants' actions."

17   Do you see that?

18   A.   Yes, I do see that.

19   Q.   And the factors that are included in

20 the baseline regression are social and

21 demographic and economic factors, right?

22   A.   That is correct, they are demographic,

23 social, and economic factors.

24   Q.   And are they the same factors that are

1 included in the direct regression?

2   A. Yes, they are the same factors that

3 are included in the direct regression.

4   Q. So we went through a whole list of

5 factors that you didn't include in your direct

6 regression. You didn't include those factors in

7 your indirect regression either, correct?

8   MR. KO: Object to the extent it

9 mischaracterizes his previous testimony and the

10 report about what factors that were actually

11 included or not.

12   But go ahead and answer.

13   A. All of the factors for which we had

14 data we included here. The only things that are

15 not included are things for which we wish we

16 had -- for things which we did not have the data

17 that -- the data do not exist that they could be

18 included.

19   Again, I want to avoid implying data

20 were withheld. No data were withheld from me

21 for any reason.

22 BY MR. KNAPP:

23   Q. So when you say that to the extent

24 that other factors modelled in the baseline

1 regression -- not modelled in the baseline

2 regression contributed to increases in opioid

3 mortality, what factors did you have in mind

4 there?

5   A. I was referring back specifically to

6 the discussion that we had earlier of the

7 analysis like that of Professor Ruhm and

8 Professors Case and Deaton.

9   So in that case there was a discussion

10 about were all of the issues associated with

11 despair in different areas included in the

12 models that Professors Case and Deaton and

13 Professor Ruhm estimated, and as you noted

14 correctly that not everything that one would

15 like to have data on to measure despair we

16 actually do have data on. And so, therefore,

17 there are variables that are omitted from the

18 model that if the data existed we would like to

19 have included in the model.

20   Q. To the extent that any of those

21 variables associated with despair for which you

22 don't have data contributed to mortality, your

23 indirect regression attributes those harms to

24 the shipments of prescription opioids?

1   A. That's not correct. To the extent

2 that they contribute to mortality -- so two

3 things. One is to the extent they're correlated

4 with the variables that are included, they will

5 be picked up by the variables that are included,

6 so it's only to the extent that they're not

7 correlated with the variables that are included,

8 so that's the first issue.

9   And then the second issue is that

10 nothing says that those variables have to

11 positively affect the mortality rate. Some of

12 them could negatively affect the mortality rate,

13 again, particularly if you're looking at the

14 part that is independent of the variables that

15 are included.

16   So it does not have to be the case

17 that any variable that -- it does not have to be

18 the case that any variable that is omitted, by

19 including it one would automatically assign

20 less -- a smaller share of opioid-related deaths

21 to opioid shipments.

22   Q. And just to be clear, you haven't been

23 able to quantify whether any of these factors

24 associated with despair that you haven't been

1 able to get data for have a positive or negative

2 impact on mortality?

3   MR. KO: Objection to the form.

4 Objection, asked and answered.

5   A. That's correct. Just to restate, I do

6 not know for the data that I don't have whether

7 the components of those variables that are not

8 correlated with the independent variables would

9 have a positive relationship with opioid

10 mortality or a negative relationship with opioid

11 mortality or no relationship with opioid

12 mortality. So I cannot give an econometric

13 answer to the question of what impact including

14 such variables would have.

15 BY MR. KNAPP:

16   Q. In preparing your indirect model, you

17 didn't consider the change in the number of pain

18 diagnoses in your -- as a variable in your

19 indirect regression?

20   A. Let me give two answers to that.

21   First, in the indirect model, we're

22 not using change variables, we're using levels,

23 because we're estimating the mortality rate at a

24 point in time.

1   In the case of approach 1, we're

2 estimating it at '93 to '95. In the case of

3 approach 2, we're estimating it -- I'm sorry.

4 In the case of approach 2, we're estimating at

5 '93 to '95. In the case of approach 1, we're

6 estimating from 2008 to '10. So the change

7 would not -- doesn't enter into those

8 variables -- excuse me, into those regressions.

9   But in addition, there's an issue

10 about including the name of pain diagnoses,

11 which is that physicians need -- for many -- in

12 many occasions physicians need a diagnosis

13 before writing a prescription. So individuals

14 who get a prescription for opioids will be

15 diagnosed generally with pain or -- and

16 oftentimes with pain.

17   Just knowing what share of

18 individuals' diagnosis of pain is conflating the

19 fact that the variation in the shipments of

20 opioids driven by the defendants' misconduct may

21 be also influencing doctors writing down of pain

22 as a diagnosis for the patient, some form of

23 pain as a diagnosis for the patient, and,

24 therefore, the pain reports.

1   So the pain reports will explain

2 mortality, but those pain reports are not an

3 appropriate measure of the true degree of pain

4 differences across areas. And that's a very

5 common issue in many areas of health economics

6 where studies show that diagnosis responds to

7 treatment in some cases, and it's not always the

8 case that treatment is an unbiased estimate

9 across areas that then -- that diagnosis is not

10 an unbiased estimate across areas that then

11 treatment responds to.

12   Q.   You didn't include a variable for the

13 number of doctor convictions related to opioid

14 prescribing in your indirect models, correct?

15   A.   I did not include them. And, again, I

16 don't think that that variable would be

17 appropriate to include in the model because that

18 is also an outcome of the misconduct on the part

19 of the defendants, at least in part, and,

20 therefore, one wouldn't want to say that the

21 shipments were due to misconduct on the part of

22 defendants -- on the part of doctors rather than

23 on the part of defendants if the misconduct on

24 the part of doctors was driven in some part by

1 the misconduct on the part of defendants.

2   Q.   I want to make sure we're clear. Are

3 you independently opining that defendants'

4 conduct caused doctors to write prescriptions

5 that they ended up getting convicted of crimes

6 for?

7   A.   No, that's not an issue on which I

8 have an opinion. I'm just saying that in the

9 model one would need -- in the econometrics one

10 would need to be careful about including a

11 variable like that because that's an issue one

12 would need to consider.

13   Q.   And are you independently opining that

14 the defendants' marketing or promotion of

15 prescription opioids had an independent impact

16 on any shipments, or are you completely relying

17 on Professor Rosenthal?

18   A.   I --

19   MR. KO: Object to the form.

20   A.   I am completing relying upon Professor

21 Rosenthal's estimates about the impact of

22 defendants' misconduct on shipments of opioids.

23 BY MR. KNAPP:

24   Q.   Did you include a variable for

1 depression diagnoses?

2   A.   I did not include a variable for

3 depression diagnosis. Again, the literature

4 shows that the variability in depression

5 diagnosis is not an independent variable of

6 itself that is measuring just the true

7 prevalence of diagnosis across areas. It's also

8 measuring the propensity of physicians to

9 diagnose the -- diagnose that particular

10 condition, the extent to which physicians are

11 going to treat depression and, therefore, what

12 conditions they choose to write down as

13 diagnoses. And so that by itself is not an

14 exogenous measure of the health of the

15 population in different areas.

16   Q.   All right. Let's just talk briefly

17 about your indirect model from 1995 to 2016.

18 Why don't we turn to Paragraph 116 on Page 70.

19   And you attribute 100 percent of the

20 unexplained residual in this indirect model to

21 opioid shipments, correct?

22   A.   That is correct. In this model the

23 entirety of the residual is attributed to opioid

24 shipments.

1   Q.   And as with your other indirect model,

2 to the extent that there are other factors that

3 are not modelled in your baseline regression

4 that contributed to increases in mortality, this

5 indirect model has the potential to overstate

6 the impact of the defendants' actions?

7   MR. KO: Object to the form. Also

8 object to the extent it mischaracterizes his

9 prior testimony and report regarding the other

10 factors that are not purportedly modelled.

11   A.   So to the extent that there are other

12 variables not in the model that are not

13 correlated with the variables that are included

14 in the model, they could influence these

15 estimates, either making them higher or lower

16 than would be true if they -- if one were able

17 to measure the data and they could be included

18 in the model. There could be a bias upwards,

19 there could be a bias downwards from including

20 any additional variables.

21   In addition, there are other ways in

22 which this model may give an estimate which is

23 too low for the impact of misconduct -- on

24 defendants' misconduct on harms or the shipments

1 on harms. And the reason for that is that over

2 time areas got better at treating people who

3 overdosed on opioids. Those are not deaths, but

4 those are harms that ought to be attributed to

5 the shipments of opioids.

6   And those all work in the direction --

7 because areas have gotten better at treating

8 opioid overdose, those all work in the direction

9 that they understate the harms that result from

10 opioid shipments because they understate the

11 mortality in later years.

12   So, for example --

13 BY MR. KNAPP:

14   Q.   Looking --

15   A.   Let me just finish.

16   So, for example, the increased

17 availability of Narcan, training in terms of how

18 to address individuals who have opioid overdose

19 would all reduce mortality, and, therefore, this

20 approach will attribute too little in the way of

21 deaths to the opioid shipments.

22   Q.   Look at footnote 53 again on Page 45.

23 Do you see in footnote 53 you only reference the

24 potential to overstate the impact of defendants'

1 actions?

2   A.   Yes, I do. I do note that there.

3   Q.   And you understand that if a variable

4 increases, contributes to increases in potential

5 mortality, then your indirect approach has the

6 potential to overstate the impact of the

7 defendants' actions, right?

8   A.   That's correct. But as we were

9 discussing, it could also understate it. I

10 wrote overstate here because I wanted to be very

11 clear to the court that this could be an

12 overstatement. And so in my desire to be as

13 accurate as possible to the court, I wanted to

14 say very specifically what the potential

15 problems with -- what the potential issues with

16 this approach are.

17   Q.   So let me make sure I understand.

18   What factors that you didn't include

19 in your indirect models that contributed to

20 increases in mortality would result in an

21 understatement of the defendants' -- of the

22 impact of the defendants' actions?

23   MR. KO: Object to the form.

24   A.   Remember, it's the part of an

1 additional variable -- I'm sorry. So if it --

2 this sentence is correct. The baseline -- if

3 there are other factors not modelled in the

4 baseline regression that contribute to increases

5 in opioid mortality, then it would overstate the

6 impact of shipments on harms. So that statement

7 is correct.

8   As we were talking about it in

9 general, there may have been other factors that

10 might lead to decreases in mortality which would

11 understate the impact, but this specific

12 sentence deals only with the overstatement.

13 BY MR. KNAPP:

14   Q.   Got it.

15   And just to be precise, I was asking

16 about increases in mortality.

17   A.   My apologies. I didn't --

18   Q.   It's been a long two days --

19   A.   I apologize.

20   Q.   -- for sure.

21   A.   I'll try to listen more carefully as

22 we go.

23   Q.   All right. So let's turn to the

24 regression you ran on crime, and I believe that

1   starts on Paragraph 124, Page 75 of your report.
2   A.   Thank you.
3   Q.   The regression that you ran on the
4   relationship between opioid shipments and crime
5   is an indirect model, correct?
6   A.   No. The regression that we ran
7   relating opioid shipments and crime is an
8   example of the direct model, so it's analogous
9   to the models that we ran for mortality in the
10   direct model.
11   Q.   Okay. So if we look at -- bear with
12   me one second.
13   Okay. In Paragraph 124, you state,
14   "This section presents a confirmatory analysis."
15   Do you see that? It's three or four lines down.
16   MR. KO: I think it's the second
17   sentence.
18   A.   Yes, I do see that.
19   BY MR. KNAPP:
20   Q.   You didn't prepare any confirmatory
21   analyses for the category of harms that fall
22   into the juvenile crimes bucket, correct?
23   A.   No, I did not do any confirmatory
24   analysis on juvenile crimes.

1   Q.   You didn't do a confirmatory analysis
2   on addiction and mental health services,
3   correct?
4   A.   No, I did not do a confirmatory
5   analysis on addiction and mental health services
6   because the data to do so are not avail -- are
7   not -- the data do not exist.
8   Q.   You didn't do a confirmatory analysis
9   on children and family services?
10   A.   No, I didn't do a confirmatory
11   analysis on children and family services because
12   the data to do so do not exist.
13   Q.   If you turn to Paragraph 130, you
14   state that, "The overall trends in property and
15   violent crime are a product of many factors,
16   only one of which is opioid use," right?
17   A.   Yes, that is correct.
18   Q.   What are the other factors that
19   contribute to overall trends in property and
20   violent crime?
21   A.   The -- there is a vast criminology
22   literature that addresses the factors that
23   influence crime. I've provided some citations,
24   although by no means an exhaustive citation

1   list, in the report.
2   So, for example, just to give one
3   example, footnote 86 on Page 77 provides one
4   paper that addresses a number of different
5   hypotheses for changes in crime. I will give a
6   few of the hypotheses -- let me give you a few
7   of the hypotheses that people mention with the
8   understanding, as I said as we began earlier, my
9   expertise is not in criminology, it's in
10   economics and particularly health economics.
11   One of the big factors that the
12   literature has looked at is changes in law
13   enforcement, so, for example, the impact of
14   increased numbers of police or of different
15   types of police on crime.
16   Another factor that the literature has
17   looked at is changes in punishment for crime,
18   so, for example, do changes in punishment for
19   crime affect the amount of crime.
20   Other factors that people have looked
21   at for changes in crime include economic
22   factors, for example, changing economic
23   opportunities; social factors, for example, the
24   distribution of the population by age and by

1   gender influences crime.
2   And so that's -- those are at least
3   some of the theories that have been put
4   forward -- or some of the factors that have been
5   put forward as influencing crime.
6   Q.   Did you control for changes in law
7   enforcement in your crime regression?
8   A.   We did not control for changes in law
9   enforcement in the crime regression.
10   Q.   And you -- strike that.
11   To the extent that changes in law
12   enforcement impact crime and they're not
13   correlated with the variables you did include,
14   your crime regression would overstate the
15   impact -- overstate, understate, or have no
16   impact on the impact of shipments on crime,
17   correct?
18   MR. KO: Object to the form.
19   A.   That is correct. There is one
20   variable here that is worth noting, which is the
21   property crime level in the case of the property
22   crime model and the violent crime level in the
23   case of the violent crime model in the base
24   period.

1   Some of what the literature has

2   hypothesized is that areas that initially had

3   more crime would have invested more in, for

4   example, law enforcement activities associated

5   with that crime. So in addition to all of the

6   other economic and demographic and social

7   variables that are included, I think that one is

8   particularly important for thinking about

9   potential instigators of changes in law

10   enforcement or potential variables correlated

11   with changes in law enforcement.

12   BY MR. KNAPP:

13   Q.   In your crime regression, did you

14   control for changes in punishments for crimes?

15   MR. KO: Object to the form.

16   A.   No, we have not controlled for changes

17   in the punishment for crimes.

18   BY MR. KNAPP:

19   Q.   To the extent that the changes in

20   punishment for crimes had an impact on the

21   overall rates of crimes, are the conclusions

22   from your crime regression either overstated,

23   understated, or have no impact?

24   MR. KO: Object to the form.

1   A.   To the extent that changes in

2   punishment are the part which is not correlated

3   with the variables that are included here, that

4   part may be associated with greater reductions

5   in crime, smaller reductions in crime. They

6   could affect the impact of shipments in any way.

7   I should say in response to your

8   question, this is another example where the high

9   adjusted R-squared is, I think, of particular

10   note; that is, overall explaining crime over

11   this 20-year period, the R-squared -- adjusted

12   R-squared for property crime is 79 percent, and

13   the adjusted R-squared for violent crime is

14   78 percent.

15   So we are explaining an enormous

16   amount of the change in crime in different

17   areas, and that is a -- is something that an

18   analyst always looks at to -- as a measure of

19   how well their model is doing.

20   BY MR. KNAPP:

21   Q.   I'm going to hand you what I'm marking

22   as Cutler Exhibit 13.

23

24   (Whereupon, Cutler Exhibit Number 13

1   was marked for identification.)

2   BY MR. KNAPP:

3   Q.   Which is titled "Understanding Crime

4   Trends Workshop Report."

5   Have you seen this document before,

6   Professor Cutler?

7   A.   I don't know if I've seen this

8   particular document. It's 11 years old. So

9   it's possible that I saw it at some point in the

10   past 11 years, but I don't know for certain.

11   Q.   All right. Can you turn to Page 129

12   of the document? Do you see there's a Figure

13   5.1 there that's titled "Heuristic Model of

14   Hypothesized Main Effects on Recent Crime

15   Trends"?

16   A.   Yes, I do see that.

17   Q.   And do you understand that these are

18   factors that may increase -- strike that.

19   Do you understand that these are

20   factors that may impact rates of crime?

21   MR. KO: Object to the extent that

22   you're asking Mr. Cutler to respond summarily to

23   a 241-page document without giving him the

24   opportunity to look at the context.

1   But if you can answer the question --

2   feel like you can answer the question, go ahead

3   and do so.

4   MR. KNAPP: I think "form" is

5   sufficient.

6   MR. KO: Noted.

7   A.   These look to be the author's -- the

8   author's presentation of factors to be

9   attributed to crime.

10   BY MR. KNAPP:

11   Q.   Which of these factors did you not

12   control for in your crime regression?

13   MR. KO: Factors on Page 241 -- or

14   129?

15   MR. KNAPP: Correct.

16   A.   We include in our models the

17   demographics about the age distribution of the

18   population. We include in the models a number

19   of variables that are going to pick up the

20   economic variables and demographic variables,

21   even if we don't have the exact specification

22   that the author puts forward here. But the

23   unemployment, wages, immigration will all be

24   correlated, quite strongly, I believe, with the

1   variables that we've included.

2   We have included illegal drug --

3   excuse me, not illegal drug. We're interested

4   in looking at the issue of opioids, so we've

5   included the opioid drug shipments, so that's

6   obviously included in the model.

7   BY MR. KNAPP:

8   Q.   Just to stop right there, you haven't

9   included variables for all illicit drug use and

10 market activity, correct?

11   A.   We have not included data for all

12 illicit drug use and market activity because

13 those data do not -- are not available.

14   MR. KO: Go ahead and finish your

15 response that you were giving previously.

16   A.   And so then the other ones are things

17 that we do not include in the model. In

18 general, I think for most of these the data on

19 prevalence in different areas over time are not

20 available on a consistent basis, so I would need

21 to look for sure. But, for example, most of

22 what I know about alcohol consumption, alcohol

23 consumption -- sort of individual level alcohol

24 consumption which one can average to come up

1   with area averages are not available in the time

2   -- for counties in the times that are entered

3   into our model so we could not include them in

4   the model. And I think that's true about a

5   number of the other variables as well.

6   BY MR. KNAPP:

7   Q.   You didn't include a variable for

8   alcohol consumption, correct, Professor Cutler?

9   A.   That's correct that it's not included.

10 And I believe the data for that do not exist.

11   Q.   You didn't include a variable for

12 firearm prevalence?

13   A.   That is correct, we did not include a

14 variable for firearm prevalence. I have done --

15 I don't think data on firearm prevalence over

16 time are -- say, at the county level over this

17 period of time exist. I'm not 100 percent sure

18 of that, but I -- that would be my guess.

19   Q.   In your crime regression -- strike

20 that.

21   In any of your regressions, you didn't

22 include proxy variables for illicit drug use and

23 market activity other than opioids?

24   MR. KO: Objection. Asked and

1   answered.

2   A.   In the case of illicit drug use and

3   market activity, we did not -- data on that do

4   not exist, so we were not able to include the

5   them in the model.

6   BY MR. KNAPP:

7   Q.   Have you seen any studies that use

8   proxy variables for illicit drug use and market

9   activity?

10   A.   Off the top of my head, I'm not -- I'm

11 not -- I don't know of any. As I said, my

12 expertise is not in criminology, so I do not

13 have a -- I don't want to be an expert -- I

14 don't want to pretend to be an expert in

15 criminology, and, therefore, I shouldn't -- I

16 won't say definitively that I know it doesn't

17 exist.

18   Q.   You didn't include a variable for

19 police force size in your crime regression?

20   A.   We did not. In this case, as we point

21 out in the report, there's not just one force.

22 There is all the contributing areas within the

23 county. So one would need to get data on all

24 the -- on the police force of all the

1   contributing areas in the county. To my

2   knowledge, that does not exist for all of the

3   areas in the county.

4   Q.   You didn't include a variable for

5   public enforcement and weapons enforcement,

6   right?

7   A.   Did you mean public order and weapons

8   enforcement?

9   Q.   Correct.

10   A.   We did not, and I do not know whether

11 any such variable exists.

12   Q.   You didn't include a variable for

13 incarceration in your crime regression?

14   A.   We did not include a variable for

15 incarceration. We have -- many of the variables

16 are likely correlated with incarceration, but we

17 do not have a specific incarceration variable in

18 the regression.

19   Q.   When you say many of your variables

20 are likely correlated with incarceration, you

21 haven't done any analysis of the actual

22 relationship between incarceration and any of

23 the variables you included in your crime

24 regression?

1   MR. KO: Object to the form.

2   A.   There are studies in the literature

3 that, for example, relate incarceration rates to

4 economic conditions, and I believe those show

5 that economic conditions are associated with

6 incarceration, and so to that extent -- that's

7 my recollection of those studies. And so to

8 that extent, those variables would be picking up

9 some of the incarceration.

10 BY MR. KNAPP:

11   Q.   My question was about you personally.

12 You didn't do any analysis of the relationship

13 between incarceration and any of the variables

14 that are included in your crime regression?

15   A.   I personally did not do analysis, so

16 the answer I gave you was based on my reading of

17 the relevant literature.

18   Q.   You didn't include a variable for

19 volume of offender re-entry in your crime

20 regression, right?

21   A.   That's correct, we did not include a

22 variable for volume of offender re-entry in the

23 regression.

24   Q.   You didn't include a variable for

1 levels of fertility control?

2   A.   As this model points out here, the

3 levels of fertility control are -- would

4 primarily affect crime -- at least as

5 hypothesized in this particular model of crime

6 -- would primarily affect crime by affecting the

7 age distribution of the population, and so we

8 have included the age distribution of the

9 population, in which case the levels of

10 fertility control would not need to be

11 controlled for here.

12   Q.   So to the extent that any of the

13 factors that we just went through that you did

14 not include in your model have an effect of

15 increasing crime and they're not correlated with

16 your variables, your crime regression would

17 either overstate, understate -- strike that.

18   To the extent that any of the

19 variables included in Cutler Exhibit --

20   MR. KO: 13.

21 BY MR. KNAPP:

22   Q.   -- Exhibit 13, Figure 5.1, increase

23 crime, rates of crime, and are not correlated

24 with the variables you included in your model,

1 then your crime regression would overstate the

2 impact of shipments on crime?

3   MR. KO: Object to the form.

4   A.   No, that's not correct. It would not

5 necessarily overstate the impact of shipments on

6 crime.

7   The impact of -- those variables could

8 very well explain some of crime. They could

9 make the R-squared for the crime regressions

10 increase by explaining more of the difference

11 in -- more differences in the change in crime

12 rates across counties.

13   They would not necessarily reduce the

14 impact of shipments. That would depend also on

15 the relationship between those variables which

16 is not correlated with the included model,

17 correlation between that and the shipments per

18 capita per day.

19   And there's no theoretical way one

20 could say that that would reduce the impact of

21 the shipment coefficient. It could very well

22 increase the impact of the shipment coefficient.

23 It could be that they're uncorrelated and the

24 shipment coefficient would remain essentially

1 the same.

2 BY MR. KNAPP:

3   Q.   So to the extent that any of these

4 variables have an impact on crime and they're

5 not correlated with your variable -- the

6 variables you included in your crime regression,

7 then your crime regression would either

8 overstate, understate, or have no impact on the

9 regression you drew between opioid shipments and

10 crime?

11   MR. KO: Object to the form.

12   A.   The conclusion that we're drawing from

13 this is about how opioid shipments in particular

14 affect crime. So it would have to be not just

15 that a variable when included explains more of

16 crime than can just be explained here, that is,

17 it's not a question of would the R-squared or

18 the adjusted R-squared increase by adding

19 additional variables, but it would have to be

20 how that changes the relationship between

21 shipments and crime. So it's that specific

22 coefficient.

23   That specific -- the change in that

24 specific coefficient is going to depend upon the

 1   correlation between the shipments variable and

 2   that unmeasured aspect of the newly posited

 3   variables to be included. That correlation is

 4   not something that one can theoretically say

 5   anything about.

 6   So one wouldn't have a basis to say

 7   this coefficient would obviously get smaller or

 8   this coefficient would obviously get bigger or

 9   this coefficient would obviously stay the same

10   here. This -- the key here is this coefficient,

11   and this coefficient -- the impact on this

12   coefficient cannot be given so easily.

13   BY MR. KNAPP:

14   Q.   Thanks for the clarification on that.

15   MR. KNAPP: Let's mark Cutler

16   Exhibit 14.

17   (Whereupon, Cutler Exhibit Number 14

18   was marked for identification.)

19   MR. KO: You've got all your

20   colleagues here, and they can't help you out?

21   MR. KNAPP: Riding solo right now.

22   All right. I'm not sure anybody is still awake

23   out there.

24   A.   I find this fascinating.

 1   BY MR. KNAPP:

 2   Q.   Yeah.

 3   A.   I find this fascinating.

 4   MR. HALLER: We have to push the bird

 5   out of the nest and see how he does.

 6   MR. KO: And?

 7   MR. HALLER: And he's doing great.

 8   BY MR. KNAPP:

 9   Q.   Let's go with -- well, strike that.

10   I just marked as Cutler Exhibit 14 an

11   article titled "Bringing Crime Trends Back Into

12   Criminology: A Critical Assessment of the

13   Literature and a Blueprint for Future Inquiry."

14   Have you seen this article before,

15   Professor Cutler?

16   A.   I don't think I have seen this article

17   before.

18   Q.   Turn to Page 48, please. Do you see

19   there's a table at the top of Page 48 titled

20   "Implied Causal Mechanisms for Factors

21   Highlighted as Explanations of the Contemporary

22   Crime Decline"?

23   Do you see that?

24   A.   Yes, I do see that table.

 1   Q.   So my question here is the same as the

 2   question that I asked you about the previous

 3   exhibit. Can you identify for me the factors

 4   that are included in Table 1 that you did not

 5   include in your crime regression?

 6   MR. KO: Professor Cutler, since

 7   you've never seen this article, go ahead and --

 8   I would advise you to take your time and look at

 9   it in detail such that you can answer

10   Mr. Knapp's questions sufficiently.

11   THE WITNESS: Thank you.

12   Since I haven't seen the paper, I'd

13   like to look through it.

14   BY MR. KNAPP:

15   Q.   Well, so, Professor Cutler, I'm just

16   asking you about the particular line items in

17   Table 1. So let me do it this way. Did you

18   include a -- well, strike that.

19   Did you include a variable in your

20   crime regression for increased community

21   cohesion and stronger social institutions?

22   MR. KO: And I would give Mr. Cutler

23   the same direction.

24   To the extent that you can answer it

 1   without looking at the entire article, since you

 2   haven't read it, I strongly advise you to go

 3   ahead and review and examine the entire article.

 4   MR. KNAPP: Mr. Ko, at this point

 5   you're just coaching the witness. He's an

 6   expert. He can handle himself. He's done a

 7   real fine job up to this point. I don't think

 8   you need to coach him up any more, and I'd ask

 9   you to please not coach him.

10   MR. KO: I think he's doing more than

11   a fine job, but I am just lodging my objection

12   for the record.

13   MR. KNAPP: That's not an objection.

14   That's an instruction. I'd ask you not to

15   instruct your expert. This is an expert

16   witness. It's totally inappropriate to coach

17   him up. Allow him to answer the question,

18   please.

19   MR. KO: Disagree with the fact that

20   I'm coaching. But go ahead and ask your

21   question again.

22   And, Mr. Cutler, if you can respond to

23   whatever question is on the record or pending,

24   feel free to do so.

1   A. I just want to look and make sure that
2 I understand the specific context around Table
3 1. So I don't -- I won't read the whole
4 article. I'll just read around Table 1.
5   (Witness reviewing document.)
6   A. So specifically with respect to the
7 increased community cohesion and stronger social
8 institutions, I do not have a variable that
9 directly measures that. There are a number of
10 variables that are in the regression model that
11 I believe would be associated with community
12 cohesion and social institutions.
13   I don't know -- because I want to
14 answer your question without reading the whole
15 study, I don't know how the authors here posit
16 to measure increased community cohesion and
17 stronger social institutions, so I don't -- I
18 cannot say to what extent the variables here are
19 likely to be correlated with this particular
20 explanation or not.
21   I think if you wanted me to talk about
22 that, I would need to take more time to look
23 through the ways that they propose measuring
24 community cohesion -- increased community

1 cohesion and stronger social institutions.
2 BY MR. KNAPP:
3   Q. Did you include a variable for
4 increased government trust in your crime
5 regression?
6   MR. KO: Object to the form.
7 Foundation.
8   A. So, again, I do not know how the
9 authors here have suggested the best way to
10 measure government trust. We do not include a
11 measure of government trust. I do not -- I do
12 not believe data exists that indicate levels --
13 changes in government trust over the time period
14 that we're looking at at the county basis, so my
15 understanding, based on my knowledge of the
16 literature of this, is that this variable would
17 not be able to be included in a model like the
18 one that we use.
19 BY MR. KNAPP:
20   Q. Did you include a variable for
21 legalization of abortion in your crime
22 regression?
23   A. The issue of legalization of abortion
24 is one where there has been a good deal, of

1 course, of economic literature. In this
2 specific case, abortion was legal throughout the
3 time period that we're looking at, thus, there
4 would be no change across the counties in the
5 status of legalization of abortion.
6   And so that variable can't have any
7 impact on crime because it -- on crime rate --
8 differential crime rate changes across areas
9 because there is no differential change in the
10 extent to which abortion was legal across
11 different areas.
12 BY MR. KNAPP:
13   Q. Did you include a variable for
14 reduction in lead exposure in your crime
15 regression?
16   A. I did not include a variable for
17 reduction in lead exposure. My reading is that
18 most of the reduction in lead exposure that the
19 studies refer to happened earlier than the time
20 period that we're looking at.
21   So typically, for example, the Reyes
22 study, which I know somewhat, the Reyes study is
23 looking at the reduction in lead in gasoline and
24 its impact on crime, and lead was taken out of

1 gasoline well before the time period that we're
2 looking at. So that would not have been a
3 variable which would have explained the change
4 in crime -- if I recall this correctly, that is
5 not a variable that would have explained the
6 change in crime over this time period.
7   Q. Did you include a variable for
8 increased time spent in the home and away from
9 public spaces in your crime regression?
10   MR. KO: Object to the form.
11 Objection, foundation.
12   A. We did not include a variable for
13 increased time spent in the home and away from
14 public spaces. I know about much of the data on
15 time use surveys, and I know two points about
16 them.
17   First is that most of the data that we
18 have from crime -- from, excuse me, time use
19 surveys comes from relatively small sample sizes
20 which cannot be disaggregated to a county level,
21 so, therefore, they could not be included in the
22 model that we estimate. That's the first point.
23   And, second, that the measurement of
24 time use is generally not consistent over time.

1 For example, things change as to whether --
2 what -- how you count time where a person is
3 doing multiple things. And so those definitions
4 change over time.
5   And, therefore, even at the national
6 level, even without thinking about the county
7 level, researchers have not found that over any
8 reasonable period of time they can look at time
9 use allocation. So, therefore, there is no way
10 to include this variable. It's simply not
11 possible to include this variable in the models
12 that we estimate.
13 BY MR. KNAPP:
14   Q. To the extent that any of the factors
15 in Table 1 that you did not include in your
16 crime regression increased crime and were not
17 correlated with the variables included in your
18 crime regression, you agree that these
19 regressions -- or these variables would either
20 increase, decrease, or have no impact on the
21 results you draw from your crime regression?
22   MR. KO: Object to the form.
23   A. I want to reiterate, to be very
24 precise, the key that we're drawing from this is

1 not can we explain more of differences in crime.
2 So the issue here is not whether the R-squared
3 increases from 79 percent and 78 percent, both
4 of which are obviously very high numbers; the
5 issue is whether they would affect the
6 coefficients on the shipment variables. And
7 that is not just a statement that says -- you
8 can't tell the impact on the shipment variable
9 just by saying if I included that variable,
10 would it help to explain changes in crime. That
11 by itself does not tell you anything about
12 whether the coefficient on the shipment variable
13 would change.
14 BY MR. KNAPP:
15   Q. Sitting here right now, you don't know
16 how any of these factors would impact the
17 coefficient on shipments, correct?
18   A. As --
19   MR. KO: Object to form.
20   A. As a theoretical matter, you cannot
21 say how these variables would affect the
22 shipment coefficient. And because the data, to
23 the best of my knowledge of them, do not exist
24 to measure them, I cannot do an estimate to say

1 how including these would affect the coefficient
2 estimate.
3   So that is, like everything, an issue
4 associated with a regression, which is that it
5 has -- it can only tell about the things it has.
6   But I again want to emphasize, just
7 saying that these variables matter is not --
8 would matter is not the issue here. It's more
9 involved than that.
10 BY MR. KNAPP:
11   Q. Let's look at Appendix 3.J in your
12 report. I want to start with Table J.1. And we
13 talked a bit about this yesterday. What is your
14 understanding of where these percentages come
15 from in Table J.1?
16   A. These percentages were given to me by
17 counsel who said that they were the output of
18 Mr. McCann's analysis.
19   Q. Have you looked at Mr. McCann's
20 report?
21   A. I have not looked at Mr. McCann's
22 report.
23   Q. Do you know if any of these
24 percentages are actually in Professor McCann's

1 report?
2   A. I have not looked at Mr. McCann's
3 report, so I can't answer that question.
4   MR. KO: I don't know for sure, Tim,
5 but I think he's not a professor.
6   MR. KNAPP: I'm elevating him.
7   A. After this, Mr. Knapp, we may choose
8 to make you a professor.
9 BY MR. KNAPP:
10   Q. Depends upon the subject, I don't
11 know. We'll have to see.
12   A. I don't know, you seem to have a
13 knowledge of econometrics that is quite
14 impressive.
15   Q. Oh, well, I appreciate that. Thank
16 you very much.
17   MR. KO: So complimentary.
18 BY MR. KNAPP:
19   Q. I would say the same about you,
20 Professor Cutler.
21   A. But not about my knowledge of law,
22 that I assure you.
23 BY MR. KNAPP:
24   Q. Okay. Well, let me just start with

1   this.
2   We received an e-mail from your
3   counsel identifying the supplemental report of
4   Dr. McCann as the source of the figures in Table
5   J.1, okay?
6   I'm going to hand you that
7   supplemental report as Cutler Exhibit 15, and
8   I'd ask you to identify for me where these
9   percentages come from.
10   (Whereupon, Cutler Exhibit Number 15
11   was marked for identification.)
12   A.   Do you want me to look through the
13   whole report to find these?
14   BY MR. KNAPP:
15   Q.   I'm just asking you if you can
16   identify them anywhere in the report.
17   A.   So as I just said, I have not seen the
18   deposition -- excuse me, the expert report of
19   Dr. McCann before this. So I would be happy to
20   look through the report to do that, and I would
21   be more than willing to do that, but I don't
22   know offhand where in the report these numbers
23   would have come have.
24   Q.   You know what, it's a short report,

1   there are only a couple of tables that look like
2   the table that you have here, so I think we can
3   really get to the heart of the issue here pretty
4   quickly.
5   A.   Okay. I will be happy to look through
6   it then.
7   (Witness reviewing document.)
8   A.   The print is getting small.
9   Q.   My understanding is that's how the
10   copy came over to us.
11   (Witness reviewing document.)
12   A.   So I've looked through the report. I
13   have not, obviously, read every page. And I'm
14   sorry, let me just put the clip back on. I
15   apologize.
16   Q.   I think it slipped under here
17   (handing).
18   A.   Thank you, sir.
19   I have looked through the report. I
20   have not read every page. And some of the pages
21   the type was too small and fuzzy for me to read.
22   From what I did look at, I did not see a table
23   with these exact numbers in it in Dr. McCann's
24   report.

1   Q.   And to be clear, Professor Cutler, all
2   of your calculations of the percent of harms
3   attributable to distributors' misconduct rely on
4   these percentages in Table J.1, right?
5   A.   Let me say that slightly differently.
6   What I was asked to do in Appendix J was to
7   demonstrate to the Court how one could use data
8   on misconduct associated with distributors to
9   infer what the harms from that were. So that
10   was a task I was given.
11   And so I developed the model that
12   would be able to use the data -- use any inputs
13   about the harms from distributors' misconduct --
14   excuse me, use data from the percentage of
15   shipments attributable to distributors'
16   misconduct to estimate the harms that resulted
17   from that.
18   The model that I built is independent
19   of the specific percentage of shipment
20   attributable to distributor's misconduct. So it
21   takes that as an input and gives an output which
22   is what are the harms associated with that by
23   type of agency in the counties.
24   If the court for whatever reason or

1   any expert would like to put in a different set
2   of inputs, the model is exactly correct, and the
3   model would give the correct outputs.
4   Obviously, if the inputs change, the outputs
5   will change. The model that I built is not
6   affected by anything that is associated with any
7   particular percentage like what is in Table J.1.
8   Q.   I want to focus for purposes of this
9   question on the outputs. I think maybe the
10   easiest way to do it is to look at Table J.2 and
11   Table J.3. The percent impact calculated in
12   both Table J.2 and J.3 relies on the percentages
13   in Table J.1, correct?
14   A.   That is correct, the specific numbers
15   in terms of the percentage impact in column M in
16   Table J.2 and column E in Table J.3 do depend on
17   the input that's provided -- that is used, in
18   this case the input from Table J.1.
19   Q.   So if we go back to Paragraph 6 of
20   your report --
21   MR. KO: Paragraph 6 of Appendix J?
22   MR. KNAPP: Paragraph 6 of Appendix J.
23   A.   Oh, I'm sorry, this --
24   BY MR. KNAPP:

1   Q.   Yeah. Stay where you are.

2   A.   Okay.

3   Q.   You say that the data in Table J.1 was

4 provided to you by counsel, you say, "I

5 understand will be set forth in reports

6 disclosed on April 15, 2019."

7   Is it fair to say as we sit here right

8 now that you don't know which expert report is

9 the source of the data in Table J.1?

10   A.   I'm reporting here what was true at

11 the time that I filed this report, and at that

12 time these data had been provided to me by

13 counsel, and I had been -- they had -- counsel

14 had indicated to me that they would be in

15 reports disclosed on April 15th.

16   I do not know whether in the

17 interim -- for example, this report is dated

18 April 3rd. I don't know whether there is any

19 subsequent report or whether -- or what exactly,

20 so I literally don't know any more than that I

21 was told that the report would be filed on

22 April 15th. And I'm accurately saying what I

23 was told here.

24   Q.   Okay. You're not independently

1 qualified to opine on whether the defendants --

2 whether any of the defendants here violated the

3 CSA, right?

4   A.   I am not making a determination as to

5 whether the defendants violated the CSA.

6   Q.   And we talked about unique attribution

7 of harms in connection with the report as a

8 whole, but I want to ask you specifically to the

9 model in Appendix J.

10   You do not attempt to uniquely

11 attribute harm between any different type of

12 defendant in Appendix J, correct?

13   MR. KO: Object to the form.

14   A.   Can you just explain by you mean --

15 what you mean by "you do not attempt to

16 distribute to any particular type of defendant,"

17 what you mean by "type of defendant" in that

18 sentence?

19 BY MR. KNAPP:

20   Q.   You said distribute, and I may have

21 said distribute. I meant uniquely attribute,

22 with an A, not a D.

23   But when I say type of defendant, I

24 mean manufacturer, distributor, pharmacy, so let

1 me ask you that.

2   In this model you do not attempt to

3 uniquely attribute harm between the different

4 types of defendants in this lawsuit, right?

5   MR. KO: Object to the form.

6   A.   In the model that I develop as a

7 whole, there is nothing that says how the harm

8 gets attributed to any particular defendant.

9   The model can then take as an input

10 the percentage of shipments associated with

11 misconduct of all the parties as a whole, some

12 of the parties, some particular group of

13 parties, and then use that to come up with an

14 output. But I myself do not come up with that

15 attribution.

16 BY MR. KNAPP:

17   Q.   And in this model, Appendix J, you're

18 not attempting to and you do not uniquely

19 attribute harm, any of the harms that you

20 analyzed, to any particular defendant, correct?

21   MR. KO: Object to the form. Asked

22 and answered.

23   A.   That's correct. Appendix J is not

24 looking at any single defendant. It's merely

1 showing how to take an estimate of

2 distributors' -- in this case an estimate that

3 was provided to me of distributors' misconduct

4 and calculate the harms that result from that.

5 And nothing in Appendix J is specific to any

6 single defendant.

7   MR. KNAPP: Why don't we take just a

8 five-minute break, and I'll be turning over the

9 mic here.

10   THE VIDEOGRAPHER: The time is

11 2:19 p.m., and we're off the record.

12   (Whereupon, a recess was taken.)

13   THE VIDEOGRAPHER: The time is

14 2:36 p.m., and we're on the record.

15   EXAMINATION

16 BY MR. HALLER:

17   Q.   Good afternoon, Professor Cutler. I'm

18 David Haller. We've just had a chance to meet

19 very briefly just before we went on the record.

20 You will not be as impressed by my econometric

21 knowledge as you were by Mr. Knapp's, so I hope

22 you'll be a little patient with me.

23   A.   I will do my best.

24   Q.   Now, near the end of your analysis,

 1   one of the things you arrive at is a percent

 2   impact, right, a percent of harms attributable

 3   to defendants' misconduct, and your endpoint

 4   there is a percent impact, correct?

 5   A.   That is correct. I estimate an

 6   endpoint which is the percentage of harms which

 7   are attributable to defendants' misconduct.

 8   Q.   And then your final step is to apply

 9   that percentage to certain assumed dollars spent

10   by the counties in various areas, correct?

11   A.   I do not apply it specifically to the

12   dollars spent by the counties. The application

13   to the dollars spent by the counties is in

14   Professor McGuire's report.

15   Q.   What do you -- what do you apply the

16   percent impact to?

17   A.   What I estimate in my report is the

18   percentage of the activities of these agencies

19   that resulted from misconduct on the part of

20   defendants.

21   Q.   So if I, for example, refer you to

22   Table 3.13 on Page 70 of your report, you can

23   see there on the right-hand column the percent

24   impact percentages that you calculated and

 1   believe to be attributable to the defendants'

 2   misconduct, is that right?

 3   A.   That's correct. Column M has the

 4   percentage of harms attributable to defendants'

 5   misconduct under the first approach that's

 6   utilized.

 7   Q.   And are those percent impacts that you

 8   calculated, are those for Cuyahoga County or for

 9   Summit County?

10   A.   These percent impacts are for the

11   average county, in this case the average large

12   county. They then -- so that's -- that's a sort

13   of average among the set of large counties.

14   They then get applied to the specific

15   utilization of the individual counties, Summit

16   and Cuyahoga.

17   Q.   So in this case you use the same

18   identical percent impact for both Cuyahoga and

19   Summit Counties, is that right?

20   MR. KO: Object to the form.

21   A.   Let me just be very careful in my

22   phrasing. This part is from what is the impact

23   of shipments on harms, and then what is the

24   impact of misconduct on shipments. So it's

 1   indicating the impact of defendants' misconduct

 2   on the harms.

 3   So that is a number that is then

 4   taken, and then that percentage is combined with

 5   data that is directly from Cuyahoga and Summit

 6   County to estimate the specific harms in each

 7   division for each of the relevant agencies.

 8   BY MR. HALLER:

 9   Q.   My question is whether you applied the

10   exact same percent impact both to the Cuyahoga

11   divisions and to the Summit divisions.

12   MR. KO: Object to the form.

13   A.   Yes, because this part is based on the

14   national model, these percentages are applied to

15   both Cuyahoga and to Summit County.

16   BY MR. HALLER:

17   Q.   And you understand that the shipments

18   into Cuyahoga and Summit were not identical

19   through the relevant period, is that right?

20   MR. KO: Object to the form.

21   Relevance.

22   A.   That's --

23   MR. KO: Go ahead and answer.

24   THE WITNESS: I'm sorry. I'm sorry.

 1   I'm sorry.

 2   MR. KO: I'm sorry. Object to the

 3   form.

 4   Go ahead and answer.

 5   A.   That is correct, the shipments into

 6   Cuyahoga and Summit were different.

 7   BY MR. HALLER:

 8   Q.   And, in fact, as Professor Gruber

 9   illustrates in his report, the shipments into

10   Cuyahoga were below the national average, and

11   the shipments into Summit were above the

12   national average, isn't that right?

13   MR. KO: Object to the form. Object

14   to the extent it mischaracterizes the entire

15   relevant time period that Dr. Gruber measures in

16   his report.

17   But you can go ahead and answer.

18   A.   I don't remember the specifics. I

19   know that both -- as we said earlier, I believe

20   both Summit and Cuyahoga are near the average

21   shipments, but I don't remember precisely which

22   side of the average they would be on.

23   BY MR. HALLER:

24   Q.   Professor Cutler, I've handed you

1   what's been marked as Cutler Exhibit 16. It's
2   the report of Professor Gruber.
3   (Whereupon, Cutler Exhibit Number 16
4   was marked for identification.)
5   BY MR. HALLER:
6   Q.   Can you turn to Page 43? And can you
7   see from that -- from the Figure 1.10 on that
8   page that the shipments into Cuyahoga were below
9   the national average throughout the relevant
10   period, whereas the shipments into Summit County
11   were for the most part above the national
12   average, with some exceptions?
13   A.   Yes, that is correct.
14   Q.   And throughout the period, the
15   shipments into Summit on an MME per capita per
16   day, throughout the entire period, the shipments
17   into Summit were higher than those into
18   Cuyahoga, correct?
19   A.   Yes, that is correct.
20   Q.   And even though the shipments as
21   between the two counties were substantially
22   different, you nonetheless thought it
23   appropriate to apply the exact same percent
24   impact in your analysis, is that right?

1   MR. KO: Object to the form.
2   A.   Remember that what these are is --
3   what these percentages are are the percentage of
4   the harms that are due to the misconduct that
5   come from looking across -- that come from
6   looking across the country. So in that case
7   there's really only one estimate that one can
8   come up with econometrically from that, which is
9   an average for the country.
10   BY MR. HALLER:
11   Q.   All right. So my question is that you
12   applied the exact same percent impact for both
13   Cuyahoga and for Summit even though the
14   shipments into those counties were significantly
15   different, right, because, for the reason you
16   said, you're applying a national average, right?
17   MR. KO: Object to the form.
18   A.   I'm using the same percentage because
19   the national average is the one that is
20   econometrically the more relevant one here.
21   BY MR. HALLER:
22   Q.   And is the answer to my question yes?
23   MR. KO: Objection. Asked and
24   answered.

1   A.   The answer is yes, and that is because
2   it is the more reasonable thing to do
3   econometrically.
4   BY MR. HALLER:
5   Q.   Thank you. I'm always willing to let
6   you have a chance to explain your yes or your
7   no, but I'd like to get the yes or no, and then
8   we can move on a little more quickly.
9   A.   My apologies. I thought I had.
10   Q.   Okay. Maybe you did.
11   A.   It clearly slipped my mind.
12   Q.   Okay. You might have. I don't have
13   the little transcript in front of me.
14   MR. KO: It's right here if you want
15   it.
16   MR. HALLER: That's all right. I can
17   only look at so many screens at once.
18   MR. KO: All right.
19   MR. HALLER: Unlike Mr. Knapp, I
20   can't, like, think and look at the same time,
21   and listen.
22   MR. KO: Let's not give him too much
23   credit.
24   MR. KNAPP: I know.

1   MR. KO: Walk out of here with a big
2   head.
3   BY MR. HALLER:
4   Q.   And a similar question, which is you
5   applied the exact same percent impact to
6   determine harms in Cuyahoga and Summit even
7   though opioid mortality in those two counties
8   was different, correct? Again, because you're
9   using a national average, right?
10   A.   In this particular step, I'm applying
11   the same percentage. As you know, these then
12   get applied to detailed data from Cuyahoga and
13   Summit that are county-specific.
14   Q.   In terms of the impact from the
15   defendants' misconduct, you used the same
16   percent, but then you apply that to what you
17   think are different levels of opioid-related
18   activity in the different divisions, correct?
19   A.   That's correct, those are applied to
20   differences in opioid -- to opioid-related
21   activity that differs across the two counties.
22   Q.   Now, looking at the same table, 3.13,
23   in column A there's a list of actual mortality
24   figures. Are those mortality figures for

1 Summit, or for Cuyahoga, or for neither?

2   A.   In column A, the actual mortality data

3 are for the set of counties as a whole.

4   Q.   So those are also national averages in

5 that column, is that right?

6   A.   Technically they're not national

7 averages because we're using only the large

8 counties. So this is the actual mortality

9 within large counties that are analyzed in the

10 model.

11   Q.   The average for the large counties, is

12 that right?

13   A.   That is correct. It is the average

14 for the large counties.

15   Q.   And do you know whether Summit and

16 Cuyahoga's actual mortality exceed or are less

17 than any of the figures in column A?

18   A.   I know that after 2010, opioid-related

19 mortality in both Summit and Cuyahoga increased

20 quite rapidly into amongst the highest tier of

21 counties that we examined.

22   In the period -- column A specifically

23 is referring to the period before 2010. And I

24 don't recall exactly where they are relative to

1 the mean. I do recall that they were not very

2 far from the mean amongst counties.

3   Q.   And you said that their mortality went

4 into one of the highest tiers after 2010. Were

5 you referring to both counties, or one of them,

6 and to what extent?

7   A.   So I don't have the exact chart in my

8 report so I want to be careful and indicate that

9 I'm giving a recollection as opposed to citing a

10 specific fact which would be in the report.

11   My recollection is that mortality

12 increased very significantly in both Cuyahoga

13 and Summit Counties. As I say, my guess is it

14 would be in Professor Gruber's report, and so

15 I'd be happy to look through it -- or I would

16 want to look through it to confirm that

17 statement.

18   Q.   As we saw previously, the shipments

19 into Cuyahoga were below the national average,

20 correct?

21   A.   That's correct. Professor Gruber's

22 report showed that shipments into Cuyahoga were

23 a little bit below the national average.

24   Q.   And if shipments affect mortality

1 everywhere in accordance with your coefficient,

2 how do you explain the fact that Cuyahoga's

3 mortality went into what you said was the

4 highest tier, as did Summit's, even though

5 Cuyahoga's shipments were significantly below

6 Summit's?

7   A.   What the data and the model that I

8 estimate and other models in the literature

9 estimate are that initially people took and

10 became addicted to prescription opioids. After

11 2010, the increase in price and decreased

12 availability of prescription opioids led people

13 to substitute, to wish to substitute into

14 illegal opioids, first heroin and then fentanyl.

15 That was economically an increase in demand for

16 illegal opioids. That increase in demand would

17 be related to the overall extent of prescription

18 opioid addiction abuse as well as to utilization

19 of specific substances, for example, OxyContin

20 or oxycodone, as shown in the papers that are

21 referenced.

22   The increase in demand differed across

23 areas, some areas somewhat higher, some areas

24 somewhat lower. How an increase in demand

1 translates into an increase in quantity depends

2 on the elasticity of supply as well as on the

3 change in demand.

4   So what we had in different areas were

5 changing demand for illegal substances. In some

6 areas there was a ready market providing illegal

7 medications -- or excuse me, illegal substances

8 and/or the ability to obtain and supply those

9 illegal substances rapidly. And so in those

10 markets, there would have been an increase in

11 the quantity of use of illegal substances that

12 might be greater than in other areas where

13 either the supply was more difficult to obtain

14 or the markets for supply were less thick, or

15 there were other things that prevented or

16 discouraged people from moving into those.

17   So the structural break in the market

18 in 2010 means that there's a lot more

19 heterogeneity in the use of illegal opioids

20 after 2010 simply because the conditions of

21 supply differ across different markets.

22   Q.   Did you do any analysis by which you

23 can specify the differences between Cuyahoga and

24 Summit such that they both ended up in what you

1 refer to as the highest tier of mortality, and

2 yet their shipments during the relevant period

3 were significantly different?

4   MR. KO: Object to the form.

5   A. Unfortunately, to do the full

6 econometric analysis here unfortunately would

7 require data on the nature of the illegal market

8 in different areas, how extensive it was

9 beforehand, the ability to obtain different

10 types of medications, the ability to distribute

11 them in different ways more or less efficiently;

12 that is, at low cost.

13   Data on those are not available.

14 They're not available in an area. They're not

15 available across areas. So the econometric

16 analysis one would want to use is not available

17 to be used in this case.

18 BY MR. HALLER:

19   Q. Did you make any attempt to do an

20 analysis of the type I just described that did

21 not rely on crime data of the type that you've

22 just referenced?

23   A. I'm sorry. Can you repeat the

24 question, sir?

1   Q. I think you said that the reason, or

2 one of the reasons you didn't do any analysis to

3 explain the difference as between Cuyahoga and

4 Summit is that you didn't have the crime data

5 that you would have liked in order to do that,

6 is that right?

7   A. It's not the crime data. It's data on

8 the supply conditions in the market. For

9 example, how easy was it for people who were

10 moving illegal drugs to be able to obtain --

11 people who were selling illegal drugs to be able

12 to obtain them, to be able to communicate with

13 customers efficiently, to be able to have access

14 to products as appropriate and so on.

15   So it's not necessarily the crime,

16 it's the market which -- clearly the market is

17 engaged in illegal activity, but it's not the

18 crime outcome that would be the defining feature

19 there.

20   Q. So you were able to do your national

21 level regression without that data, correct?

22   A. That's correct. The national level

23 analysis goes up to the period of 2010 where

24 there was not a very significant role for deaths

1 due to illegal opioids, where a lot more of the

2 deaths were due to legal opioids. And so

3 economically it was reasonable to estimate the

4 model through that period of time, whereas

5 economically it was not reasonable to estimate

6 it after that period of time.

7   Q. So let's focus on the period 2010 and

8 prior. Did you make any attempt to do any

9 analysis that would explain differences between

10 Cuyahoga and Summit such that they had similar

11 levels of mortality but significantly different

12 levels of shipments?

13   A. So we have the -- the model that would

14 be most informative to that question is the

15 direct model for opioid mortality rate changes

16 from 1993, '95, to 2009, '10. And so what that

17 model does is it looks at the impact of

18 shipments per capita on mortality rates, and

19 then controls for a number of other factors.

20   And I think the question that you're

21 asking is do those controls for other factors

22 help to understand the difference between how

23 shipments in the two counties are related

24 relative to how mortality in the two counties

1 are related.

2   I haven't done the specific analysis

3 that you are suggesting, which is to see after

4 controlling for these other factors whether one

5 can help -- whether that -- how that sheds light

6 or what light that sheds on the relative

7 difference in the change in the mortality rate

8 in two counties in comparison to the relative

9 difference in the shipments of opioids to those

10 areas. It is something that could be done, but

11 I have not done so.

12   Q. I think in response to one of the

13 questions from Mr. Knapp you suggested -- and my

14 notes might not be perfect on this -- that it

15 was impossible to have a coefficient for each

16 county, is that right?

17   A. That's correct. There's only one

18 observation per county here. So the regression

19 has 400 observations. Each county is

20 represented once. So this is, if you will,

21 looking at a scatterplot of what is the change

22 in mortality -- opioid-related mortality in the

23 county as related to shipments of opioids to the

24 county while adjusting for the many other

1   factors that go on.

2   But each county is in this regression

3   only once, so there's no way from this to

4   estimate a separate relationship between

5   shipments per capita and mortality in any single

6   county as it would compare to a different

7   county.

8   Q.   But if you wanted to do an analysis of

9   Summit versus Cuyahoga, you could do a panel

10   regression to examine that relationship,

11   correct?

12   A.   That is correct. So a different

13   methodology would be to use a panel data model

14   where one took data for Summit and saw whether

15   one could explain the increase in mortality by

16   shipments in Summit, and then compared that to a

17   model estimated for Cuyahoga where one would see

18   whether the increase in shipments in Cuyahoga

19   were related to mortality in Cuyahoga.

20   So with that kind of panel model for

21   the two -- for each of those two counties, that

22   would be a different way of estimating the

23   relationship between shipments and mortality in

24   the two counties.

1   Q.   But you didn't do that, correct?

2   A.   I didn't do that. And I judged this

3   model to be superior economically, and so let me

4   just give you a little bit of a sense about why

5   that's the case.

6   First, the time series data on which

7   those models would be based would be a very

8   short time series for each county, so it would

9   really only have, for example, 11 years if one

10   wanted to look by specific type of opioid

11   mortality, or 15, roughly, years if one wanted

12   to look for any opioid mortality rate.

13   And, in general, econometrically you

14   don't want to be estimating models where you

15   want to be controlling for lots of independent

16   variables with very short time periods like

17   that. That's not something that economically

18   one would want to do.

19   In addition, in a model like that, one

20   would have to make very stringent assumptions

21   about what is the relationship between --

22   exactly between shipments in any one year and

23   mortality in any set of subsequent years. And

24   doing that in a very -- what's called a

1   high-frequency sense, that is, year to year,

2   it's very difficult to know how to make that

3   assumption because the harms from opioid use in

4   any one year may not translate into -- or the

5   deaths from opioid use starting in any one year

6   may not translate -- may not be apparent until

7   several years later.

8   So it would require a lot more in the

9   degree of assumptions to make -- to estimate a

10   model that way. As a result, I concluded that

11   econometrically this was a much superior method

12   than to do individual county time series

13   analysis.

14   Q.   And are those -- is that the totality

15   of the reasons why you think a panel analysis

16   wouldn't be appropriate and why you didn't do

17   it?

18   MR. KO: Object to the form.

19   A.   I just want to be clear. What you had

20   suggested was to do a model for each county

21   separately. That's not a panel model in quite

22   the same way that you're -- the word panel model

23   refers to something different. So I was giving

24   you an explanation as to why one would not want

1   to do a model separately by -- for each county.

2   BY MR. HALLER:

3   Q.   Okay. So you were addressing the

4   question of whether you could do a time series

5   for each county separately?

6   A.   That's correct.

7   Q.   Okay.

8   A.   That's the answer that I was giving.

9   I apologize if that's not the question you asked

10   me.

11   Q.   That's fine.

12   And that's something that someone

13   could have done, but you didn't do it because

14   you think there's not enough years to do that

15   well, correct?

16   A.   That's one reason.

17   And then the other reason why is

18   because it would require making very specific

19   assumptions about the timing of when shipments

20   affect mortality in a particular time

21   relationship that one doesn't have to make over

22   a longer period of time.

23   Q.   What is your assumption about the time

24   period by which it takes shipments to affect

1   mortality?

2   A.   I'm not really making an assumption

3   about that. I'm looking at the totality, or in

4   this case the average of the shipments over the

5   entire time period. So I don't -- so I'm

6   explicitly not specifying what an exact

7   relationship would be like, in part because I

8   don't have a very firm basis for doing so.

9   Q.   So to get us on the same page, so we

10   just discussed a time series that could have

11   been done, but you didn't do for the reasons you

12   stated.

13   Another suggested way that I had to do

14   this, if you wanted to look at these two

15   counties separate and apart from the national

16   level, sort of total county level analysis, is

17   you could have done a panel regression which

18   included these two counties, either just those

19   two counties or with a few other counties, to

20   assess the individual affect of shipments on

21   these counties, correct?

22   MR. KO: Object to the form.

23   A.   That's correct. One could have done a

24   panel model where one allowed the coefficient on

1   shipments to differ between these counties and

2   other counties.

3   Again, that faces the same issue,

4   which is that in order to identify the effect

5   for these counties, one would, in essence, be

6   using roughly 15 years of data. So you'd be

7   looking for a different relationship between

8   shipments and mortality in these counties

9   relative to other counties, and you'd only have

10   15 years of data to do so.

11   In addition, you'd have to specify

12   very strictly what that relationship looks like.

13   And econometrically it's very difficult to

14   estimate something with only 15 years of data in

15   a time series context and really get a different

16   estimate. That's not something that

17   econometrically is a very comfortable regression

18   to be estimating.

19   BY MR. HALLER:

20   Q.   How many jurisdictions do you think

21   are too few to run the panel regression? I

22   mean, you thought 400 was plenty for your

23   analysis, right? How many is too few?

24   MR. KO: Object to the form.

1   A.   This is a cross-section analysis, so

2   it's not a panel because each observation is

3   here only once.

4   So if you -- if I'm understanding your

5   question correctly, which is you, David, clearly

6   feel comfortable estimating this with 400

7   observations, how many observations would have

8   been too few, I don't -- there's no hard and

9   fast econometric statistics rule that says when

10   is there too few.

11   In general, we have a lot of

12   independent variables. We have something like

13   45 independent variables in this model. That's

14   a lot. And so you need a reasonable amount of

15   data in order to estimate that. You need

16   obviously at least 45, but you need many more

17   observations than that in order to estimate this

18   model.

19   So the more things you want to control

20   for, which as we've discussed we wanted to

21   control for a lot, the more observations that

22   you need, and the less you can rely on very,

23   very small sets of data.

24   BY MR. HALLER:

1   Q.   So do you have a view on what the

2   minimum would be in order to do what you would

3   believe to be a sufficient panel analysis by

4   which one could derive coefficients for Summit

5   and Cuyahoga?

6   MR. KO: Object to the form.

7   A.   I don't have a specific number, so

8   there's not a statistical number of counties

9   that one would give. But, in general, you would

10   have to do -- you would have to have -- if you

11   wanted to make one group of counties have a

12   different coefficient than another group of

13   counties, you would need, in my estimation, far

14   more than two counties to do that. I would be

15   very surprised if the standard errors would

16   permit doing that for just two counties.

17   BY MR. HALLER:

18   Q.   Could you do it with five Ohio

19   counties?

20   A.   So there's not a statistical basis in

21   order to say yes or no. If you said to me as a

22   scholar, suppose that someone submitted a paper

23   and you were reviewing a paper where they have

24   estimated a panel model with five counties and a

1 lot of controls and a time series relationship

2 that's complex to specify, I would be very

3 skeptical going in that that methodology would

4 yield results that I would judge to be credible.

5 BY MR. HALLER:

6   Q.   Did you try or consider doing such a

7 panel analysis?

8   A.   I did not do a panel analysis. I did

9 not do a panel analysis. In terms of

10 consideration, we talked about all sorts of ways

11 to do things, but I did not estimate a panel

12 model or -- and certainly not a panel model

13 that -- with separate coefficients for these

14 bellwether counties.

15   Q.   Professor Cutler, I want to circle

16 back to the question of the four counties that

17 you left out of your regression. Those were the

18 four counties that had the highest level of

19 shipments during the relevant period, correct?

20   MR. KO: Object to the form.

21   A.   Those four counties had not just the

22 highest level, but extremely high levels, so

23 they were very different from the other counties

24 that were included.

1 BY MR. HALLER:

2   Q.   And I take it they did not have the

3 four highest levels of opioid mortality change,

4 is that right?

5   A.   I don't recall exactly the opioid

6 mortality change in those -- with those four

7 counties. I do recall that the regression

8 coefficients were not very materially different

9 when those four observations were included or

10 excluded.

11   And so as an econometrician, one of

12 the things that you always do is you look for

13 outliers in the data, and to the extent there

14 are outliers, you need to decide whether they're

15 appropriately included or not included.

16   When the results don't differ much,

17 you don't have to worry about it so much, so I

18 didn't have to inspect each one individually.

19 But given what I knew about potential for

20 transshipments and given the very significant

21 outlier status of those counties, I made the

22 decision not to include them in these models.

23   Q.   So to go back to my question, you

24 don't know as we sit here today whether those

1 four counties did or did not have the four

2 highest levels of opioid mortality change, is

3 that right?

4   A.   I do not know exactly where they fall

5 in the distribution of mortality rate changes.

6   Q.   Do you -- is it your recollection that

7 not all of them were in the top four for opioid

8 mortality change?

9   A.   I don't recall. And so rather than

10 saying something incorrect, let me just repeat

11 that I don't recall exactly where they stood in

12 that.

13   Q.   Is there something in your report you

14 can refer to to determine what the -- whether

15 those four excluded counties had the highest

16 level of opioid mortality change or not?

17   A.   Unfortunately, no, I don't believe I

18 included any specific analysis of those four

19 counties in either the report or the

20 supplemental data appendix.

21   Q.   So in your direct model, when you

22 excluded those four counties, you said that this

23 change was small to your coefficient, but

24 directionally, once you excluded them, did the

1 coefficient go up or go down?

2   MR. KO: Object to the form.

3   A.   I don't remember, but I also

4 suspect -- we kept iterating on these models in

5 terms of making sure that we were including as

6 many variables as we could and developing new

7 data to include and so on.

8   I believe that -- although I'm not

9 100 percent certain, I think that I had made the

10 decision to eliminate those four counties before

11 we reached the final set of variables that were

12 included here.

13   So I don't have in hand and I'm not

14 sure I -- I'm not sure I knew for this final

15 specification what the impact was of excluding

16 or including those four counties.

17 BY MR. HALLER:

18   Q.   Let's look at -- let me then ask a

19 question about the impact on the model as of the

20 time that you measured the impact.

21   Given the model in its state at that

22 point when you excluded the four counties, what

23 directionally happened to the coefficient? Did

24 it go up or go down?

1   A.   I --

2   MR. KO: Object to the form.

3   I just want to clarify just to make

4   the record clear that obviously Professor Cutler

5   has a lot of models. I just want to make sure

6   that the record is clear that we're talking

7   about the direct regression model right now.

8   MR. HALLER: Right.

9   A.   I do not recall exactly what happened

10   to the coefficient. I'm sorry, I don't recall

11   that.

12   BY MR. HALLER:

13   Q.   And is there anywhere in your report

14   where we could look to see directionally what

15   happens if you include or exclude those four

16   counties?

17   A.   No, there's nowhere in the report that

18   has it, because I made the determination at some

19   point that it was more economically appropriate,

20   econometrically appropriate to exclude those

21   counties. So, therefore, I didn't focus on

22   examining the difference in the regression model

23   estimates with those counties included as

24   opposed to excluded.

1   Q.   So your report discloses the fact that

2   you excluded four counties, but doesn't disclose

3   the directionality of any change that that

4   exclusion had on the model, correct?

5   A.   That's correct. The report notes the

6   exclusion. It does not present a specific

7   analysis of that as indeed there -- let me just

8   go back.

9   There are literally hundreds of

10   decisions that had to be made about processing

11   the data, the analysis of the data. We were

12   discussing earlier with Mr. Knapp the specific

13   time periods and so on. So there were literally

14   hundreds of decisions.

15   I think a report that tried to

16   identify the impact of those hundreds of

17   decisions would have gone on for probably

18   thousands of pages, and so I didn't -- I didn't

19   think that that was a very valuable thing to do.

20   Q.   So because you don't know as we sit

21   here today, let's assume that if the exclusion

22   of those counties increased the coefficient,

23   then that also would have increased your percent

24   impact, and that ultimately would have increased

1   the damages numbers of Mr. McGuire, correct?

2   A.   That is correct. If the coefficient

3   here were to increase, that would increase the

4   harms that result from misconduct on the part of

5   defendants, and, therefore, that would increase

6   the damage estimates that Professor McGuire

7   estimates.

8   Q.   Can I refer you, please, to the Table

9   J.1 that we were looking at earlier? What

10   I'd -- what I'd like to do is compare the

11   percentages that are on Table J.1 with the

12   percentages that appear in column C of your

13   Table 3.9 on Page 62.

14   Do you have any understanding as to

15   whether -- what the relationship is between the

16   percentages that appear on J.1 as compared to

17   the percentages that appear in column C of Table

18   3.9?

19   In other words, are the shipments that

20   are attributable to distributors' misconduct --

21   let me put that another way.

22   Are the shipments attributable to

23   defendants' misconduct that appear in column C,

24   are those a subset of the shipments attributable

1   to distributors' misconduct in Table J.1, or are

2   they like some sort of an overlapping Venn

3   diagram, or what is the relationship between

4   those two?

5   MR. KO: Object to the form.

6   A.   Let me answer your question I think as

7   I understand it, and you then please tell me if

8   I'm not getting your question correctly.

9   The estimates in column F of Table 3.9

10   come from Professor Rosenthal's analysis and

11   refer to the cumulative percent of shipments

12   attributable to defendants' misconduct. Those

13   are her estimates based on looking at the data

14   that she does on the promotion of -- the

15   misconduct associated with the promotion of the

16   drugs at issue here and then translating that

17   through her econometric methodology into the

18   percentage of shipments that they would have --

19   that they resulted in.

20   Appendix -- Table J.1 in Appendix 3.J

21   is an estimate of Mr. McCann about shipments --

22   percentage of shipments attributable to

23   distributors' misconduct. I do not know -- and

24   so it's not the entirety of the defendants in

1   this case. It's just the distributors.

2   I do not know how Mr. McCann went

3   about estimating this, so I did not see his

4   report. These numbers were given to me so that

5   I could demonstrate to the court how with data

6   on the percentage of shipments attributable to

7   distributors' misconduct one could then estimate

8   the harms that result from that.

9   So my analysis of these data is not to

10   endorse them or not to say anything about them

11   other than that with data like this, one could

12   estimate the harms that result from

13   distributors' misconduct.

14   BY MR. HALLER:

15   Q. You just referred to Mr. McCann a

16   couple times. Footnoting, you and Mr. Knapp

17   established that we don't know if these figures

18   actually came from Mr. McCann, right?

19   MR. KO: Object to the form.

20   BY MR. HALLER:

21   Q. The J.1 numbers.

22   MR. KO: Object to the form.

23   A. The only thing I can say here is

24   that --

1   BY MR. HALLER:

2   Q. You got them from counsel?

3   A. I got them from counsel. That is the

4   one statement that I can say with certainty.

5   Q. And I just wanted to say in your last

6   answer when you referred to Mr. McCann, that was

7   shorthand for you got them from counsel, right?

8   A. That's --

9   MR. KO: Object to the form.

10   A. That is correct. I do not wish to say

11   anything other than that.

12   BY MR. HALLER:

13   Q. And my question is pretty simple, and

14   I think I know the answer, which is that you

15   don't know, but I just want to make sure that

16   you don't know.

17   So if we look, for example, at 1997,

18   Ms. Rosenthal says that 18 percent of shipments

19   are attributable to defendants' misconduct.

20   Counsel says that 50 percent of shipments are

21   attributable to distributors' misconduct.

22   Are those the same shipments or are

23   they two -- are different shipments that add up?

24   Like is the total number of shipments, do we add

1   those two numbers, or is 18 percent a part of

2   the 50 percent, or you don't know?

3   MR. KO: Object to the form.

4   A. The short answer is I don't know

5   because I do not -- I do not have Dr. McCann's

6   calculations.

7   BY MR. HALLER:

8   Q. Now, did you make any effort to

9   develop a unitary model that would -- you know,

10   a direct model that would apply throughout the

11   time period including past 2010 through the

12   addition of additional variables such as maybe a

13   heroin price variable or a fentanyl availability

14   variable?

15   MR. KO: Object to the form. Asked

16   and answered.

17   A. The data that one would need to do

18   that is not price data. Price data are not the

19   appropriate ones there because the data that we

20   have through 2010 are shipments of opioids which

21   are a proxy for consumption of opioids.

22   The comparable data that one would

23   need post 2010 would be ideally consumption of

24   total opioids, legal or illegal, or in the case

1   of the proxy, shipments to an area of opioids,

2   legal and illegal. So one actually needs the

3   quantity data, not the price data, to do the

4   regression.

5   BY MR. HALLER:

6   Q. Did you read the transcript of

7   Professor Gruber's deposition?

8   A. No, I have not read the transcript of

9   Professor Gruber's deposition.

10   Q. And have you spoken to Professor

11   Gruber in between the time of his deposition and

12   yours?

13   A. I have not spoken with Professor

14   Gruber between the time of his deposition and

15   mine.

16   Q. Did you read Mr. Gruber's report --

17   his final report after it was issued?

18   A. Yes, I did read Professor Gruber's

19   final report.

20   Q. Did you read any drafts of Professor

21   Gruber's report prior to its being issued?

22   A. Yes, I did read drafts of Professor

23   Gruber's report prior to when it was issued.

24   Q. And when you read Professor Gruber's

1   report, was there -- when you read the draft,

2   did you -- was there anything that you thought

3   was incorrect that you asked him to correct?

4   MR. KO: I'm going to instruct -- at

5   this point instruct Professor Cutler not to

6   respond to the extent any of those

7   communications involved counsel or with counsel.

8   BY MR. HALLER:

9   Q.   My question is non-substantive.

10   Did you have a correction or did you

11   not have a correction to any of his drafts?

12   MR. KO: Well, and I'm instructing you

13   to the extent that these purported corrections

14   involved communications with or involving

15   counsel, I'd instruct you not to answer.

16   A.   All of these communications involved

17   counsel.

18   BY MR. HALLER:

19   Q.   Focusing on Professor Gruber's final

20   report, is there anything in it that you think

21   is wrong?

22   A.   There's nothing in Professor Gruber's

23   report that I think is incorrect.

24   Q.   And do you agree with all the

1   statements in Professor Gruber's report?

2   A.   I agree with all the conclusions that

3   Professor Gruber reaches. I think when you say

4   do I agree with all of the statements, I

5   don't -- what I hear when you say that is do you

6   agree with every sentence that Professor Gruber

7   has written. And I don't know for sure whether,

8   just because I haven't -- I didn't do that, I

9   don't know for sure whether if you chose every

10   single sentence I would agree with it. But his

11   conclusions I certainly agree with.

12   Q.   Professor Gruber in Paragraph 74 says

13   that prescriptions drive shipments to an area.

14   Do you agree with that?

15   MR. KO: Let him get there.

16   A.   I'm sorry. I'm sorry. Can you just

17   point me to the specific --

18   BY MR. HALLER:

19   Q.   Yes. In Paragraph 74 on Page 52 in

20   the second line, Professor Gruber says,

21   "Prescription activity" -- and I'm going to omit

22   the word "which" -- but "Prescription activity

23   drives shipments to an area."

24   Do you see that?

1   A.   Yes, I do see that.

2   Q.   Do you agree with that statement?

3   MR. KO: Object to the form, and

4   object to the extent it mischaracterizes the

5   complete sentence of Paragraph 74 in the Gruber

6   report.

7   A.   What Professor Gruber is talking about

8   in this sentence is that he's making the point

9   that per capita shipments, many of which are

10   associated with prescriptions, although, as we

11   were talking about earlier, not everyone is

12   associated with its own prescription, but many

13   of which are associated with prescriptions bears

14   little relationship to medical need. That

15   statement that per capita shipments bears little

16   relationship to medical need is something that I

17   agree with.

18   BY MR. HALLER:

19   Q.   My question is, do you agree with the

20   clause in the middle of the sentence which says

21   that "Prescription activity drives shipments to

22   an area"?

23   MR. KO: Clause relative to what? I'm

24   going to object to the form, and also object to

1   the extent it mischaracterizes the complete

2   sentence in Paragraph 74 of the Gruber report.

3   A.   I do not read Professor Gruber's

4   sentence to mean that he believes that

5   prescriptions are independent variable and that

6   the prescriptions explain shipments

7   independently of any misconduct on the part of

8   defendants.

9   That is, put another way, I do not

10   believe that Professor Gruber believes the

11   causal chain -- I do not read the sentence as

12   Professor Gruber suggesting that the causal

13   chain begins with a prescription and not -- and,

14   therefore -- and I do not read this as him

15   saying that the causal chain does not begin with

16   misconduct on the part of the defendants.

17   BY MR. HALLER:

18   Q.   Well, let's put aside causality for a

19   moment. Do you believe that prescription

20   activity is very highly correlated with

21   shipments?

22   A.   The data that we have from Professor

23   Rosenthal's report as well as -- I believe other

24   data in the literature, but certainly in

1 Professor Rosenthal's report is that

2 prescriptions track shipments very well over

3 time.

4   Q. So with regard to your direct model,

5 if instead of using shipments you had used

6 prescription activity, if you had data for

7 county-by-county prescription activity, do you

8 believe that your model would generate

9 substantially the same coefficient with

10 prescription activity driving opioid mortality?

11   MR. KO: Object to the form.

12 Objection, scope.

13   A. The coefficient would certainly be

14 different. The coefficient is in terms of the

15 relevant units.

16   So in the case of the shipments to the

17 area, the units are milligrams of morphine

18 equivalent per capita. In the case of

19 prescriptions, it might be something like number

20 of prescriptions per capita. Those units are

21 not the same, so the coefficients should be

22 extremely -- would be expected to be very

23 different from those regressions.

24 BY MR. HALLER:

1   Q. So what if -- what if we convert the

2 prescriptions to milligram equivalents,

3 milligram morphine equivalents, my question is,

4 if you had run your direct regression using

5 prescription activity, do you believe that it

6 would result in substantially the same

7 coefficient in relation to driving opioid

8 mortality?

9   MR. KO: Objection, form. Objection,

10 scope.

11   A. I don't want to hazard a guess as to

12 what the coefficient would be. In general --

13 and I also want -- would want to compare the two

14 series. The ARCOS data includes, I believe it

15 is six different categories of where drugs are

16 shipped to. The prescriptions may only capture

17 one of those areas or potentially more than one.

18   In order to judge those two, which,

19 first off, I don't -- I don't have an

20 econometric way to estimate whether they would

21 be similar. But in order to judge those two,

22 what I would want to see is which one is picking

23 up more of what we think would be the shipments

24 that would be associated with harms, those that

1 come from prescriptions themselves or those that

2 come from all shipments to all the retail

3 categories that are picked up in ARCOS.

4 BY MR. HALLER:

5   Q. So we established a moment ago that

6 prescription activity is very highly correlated

7 with shipments, right? That's what you've said.

8   A. Certainly in aggregate they're very

9 highly correlated.

10   Q. So don't you have the belief that if

11 you pulled out shipments from your direct model

12 and dropped in prescription activity which is

13 very highly correlated that your model would

14 show substantially the same result?

15   MR. KO: Object to the form.

16 BY MR. HALLER:

17   Q. Same relationship?

18   MR. KO: Objection to the form.

19 Objection to scope.

20   A. You're asking me to speculate about an

21 econometric analysis with different variables.

22 What I'd really like to do is to get more

23 information on not just the aggregate time

24 series relationship between them, but on the

1 cross-sectional relationship between them before

2 I make that -- before I make a statement about

3 that. The aggregate time series correlation is

4 not the correlation that would be relevant for

5 the hypothetical that you're suggesting.

6 BY MR. HALLER:

7   Q. So the short answer is you don't know,

8 is that right?

9   MR. KO: Object to the form.

10 BY MR. HALLER

11   Q. You'd need more data to know; you

12 wanted to look -- you'd want to look at it a

13 little more closely?

14   MR. KO: Object to the form.

15   A. The short answer is that in order to

16 consider any change in the model, in any model,

17 not just this model, in any model that one does

18 as an economist and as an applied economist, you

19 need to understand exactly the data that you're

20 using. And it's hazardous to speculate about

21 what an empirical relationship ought to be

22 before you do the analysis.

23 BY MR. HALLER:

24   Q. Did you make any effort to run your

1   direct model using prescriptions instead of

2   shipments?

3   MR. KO: Objection. Asked and

4   answered.

5   A.   No, we did not have the data with

6   which we could estimate the model with

7   prescriptions.

8   MR. HALLER: Why don't we go off the

9   record. We might have one more switch.

10   THE VIDEOGRAPHER: The time is

11 3:29 p.m., and we're off the record.

12   (Whereupon, a recess was taken.)

13   THE VIDEOGRAPHER: The time is

14 3:31 p.m., and we're on the record.

15   EXAMINATION

16 BY MR. GEISE:

17   Q.   Good afternoon, Professor Cutler. My

18 name is Steve Geise. We had a chance to meet

19 earlier in the deposition. I'm with the Jones

20 Day law firm, and I represent Walmart in this

21 case.

22   A.   Can you just spell your last name for

23 me?

24   Q.   I sure can. It's G-E-I-S-E.

1   A.   Thank you, sir.

2   Q.   Professor Cutler, we don't have a lot

3   of time left, and the good news is I don't have

4   a lot of questions, but I do have a few

5   follow-ups on some of the things you've talked

6   about either yesterday or today.

7   I would like first to direct your

8   attention to Exhibit 9, which is the Evans

9   article that you discussed yesterday.

10   A.   Yes, sir.

11   Q.   And in particular, if I could ask you

12 to turn your attention to Page 3 of Exhibit 9,

13 if you look at the first full sentence on the

14 left-hand column of Page 3, Evans and his

15 co-authors write, "The Food and Drug

16 Administration (FDA) has promoted the

17 development of abuse-deterrent opioids to

18 pharmaceutical companies and worked with

19 manufacturers to bring these products to market

20 as quickly as possible."

21   Do you see that?

22   A.   Yes, I do see that.

23   Q.   And the Evans article and other

24 articles you discussed both in your report and

1   during your deposition look to, in particular,

2   the reformulation of OxyContin in 2010, correct?

3   A.   They certainly used the reformulation

4   of OxyContin to understand the trends in markets

5   and harms associated with opioids, in particular

6   the transition from legal to illegal opioids.

7   Q.   And you would agree that the purpose

8   of a reformulation of an abuse-deterrent form of

9   a drug is to deter abuse of the drug, is that

10 accurate?

11   MR. KO: Object to the form.

12   A.   My understanding was that the idea was

13 to reduce the abuse associated with the drug.

14 BY MR. GEISE:

15   Q.   Was it known to healthcare economists

16 in 2010 that a reduction in a prescription drug

17 of abuse could cause a thickening in an illicit

18 market for drugs?

19   MR. KO: If you can speak as to all

20 healthcare economists.

21   Object to the form.

22   A.   There has been a literature for quite

23 some time on substitution across different types

24 of drugs -- across different -- excuse me,

1   across different types of substances. So there

2   is a literature on both gateway drugs; that is,

3   one drug being used to -- being used and then

4   progressing to another drug. And there is also

5   literature on substitution; that is, prices of

6   one drug changing leading to changes to another

7   drug -- or another substance, excuse me.

8   I do not know of an article that has

9   said it specifically with respect to these

10 particular drugs, but as a general economics,

11 health economics concept, yes, the analyses that

12 suggest this could occur -- analyses that

13 suggest this could occur, many predate 2010.

14 BY MR. GEISE:

15   Q.   At the time that the FDA was promoting

16 the reformulation of abuse-deterrent opioids, do

17 you recall if there was commentary from

18 economists about the impact it could have on

19 illicit drug markets?

20   A.   I do not recall any specific

21 commentary as to what impact this might have on

22 illicit drug markets.

23   Q.   Do you recall if the DEA offered a

24 position statement about the impact on illicit

1 drug markets that could come from the

2 reformulation of OxyContin in 2010?

3   A.   I do not recall if the DEA had any

4 statements on the potential impact of the

5 reformulation.

6   Q.   Would you agree that the literature

7 that predates 2010 with regard to an analyses

8 that could suggest that a thickening of the

9 market could occur was available to both the FDA

10 and the DEA?

11   MR. KO: Object to the form.

12   A.   The articles that suggested possible

13 substitution of one substance to another were

14 both -- were all -- all would have been in the

15 peer-reviewed literature. Either they would

16 have been published or they would have been

17 available as working papers which are generally

18 able to be circulated in economics. So I

19 believe that any such analysis would have been

20 available widely.

21 BY MR. GEISE:

22   Q.   In your report and in some of the

23 articles that you cite within your report,

24 there's a reference to prescription drug

---

1 monitoring programs, correct?

2   A.   Yes, that is correct.

3   Q.   Professor Cutler, have you conducted

4 any research into the development and evolution

5 of Ohio's prescription drug monitoring program?

6   A.   I have not conducted any research into

7 the development of Ohio's prescription drug

8 monitoring program.

9   Q.   Do you know the acronym by which

10 Ohio's prescription drug monitoring program is

11 referred?

12   A.   I do not know the acronym specific to

13 Ohio. In the literature in general they are

14 termed PDMPs. They're said faster than that,

15 PDMPs. So people tend not to refer to the

16 specific acronym for any individual state.

17   Q.   Do you know what the specific acronym

18 is for Ohio's PDMP?

19   MR. KO: Objection. Asked and

20 answered.

21   A.   No, I do not know the specific acronym

22 for Ohio's PDMP.

23 BY MR. GEISE:

24   Q.   Professor Cutler, if I could turn you

---

1 to Page 5 of Exhibit 9, still the Evans article,

2 and direct your attention to the right-hand

3 column. Near the end of the paragraph above

4 Subsection 3 to a sentence that reads, "In the

5 population of people who use pain medicine

6 recreationally, few eventually moved to heroin.

7 According to data from the third quarter of 2010

8 through the end of 2014 in the annual NSDUH,

9 among respondents who used pain medicine

10 recreationally over the past year, less than 1

11 percent said they ever used heroin."

12   Do you see that?

13   A.   Yes, I do see that.

14   Q.   Do you agree from that data that over

15 99 percent of recreational prescription opioid

16 users ever use heroin?

17   MR. KO: Object to the form.

18   A.   I obviously have not done the

19 calculation myself, but that is a correct

20 interpretation of that sentence.

21 BY MR. GEISE:

22   Q.   And, Professor Cutler, if I could turn

23 your attention to Page 13 of Exhibit 9. In the

24 second paragraph under the heading "Conclusion,"

---

1 the authors write, "An important caveat is that

2 we are able to examine only short run impacts of

3 the reformulation. If the stock of opioid

4 abusers is significantly reduced in the long run

5 because of the introduction of ADFs, then it is

6 likely that the stock of heroin users would also

7 be reduced in the long run. As a consequence,

8 although there does not appear to be a reduction

9 in total opioid and heroin deaths due to the

10 reformulation of OxyContin in the first five

11 years after reform, there could be a reduction

12 in these death rates in the long run."

13   Do you see that?

14   A.   Yes, I do see that.

15   Q.   Does that caveat work opposite to a

16 thickening theory?

17   MR. KO: Object to the form.

18   A.   No, not really. What this caveat is

19 saying is that -- so the thickening theory is

20 that as people move from legal opioids to

21 illegal opioids, the market gets thicker, and so

22 that's what I'm citing evidence and showing

23 empirically in my report.

24   What Professor Evans and his

1 colleagues are talking about here is that that

2 is absolutely occurring in the short run, indeed

3 there are papers, one of the two that I cite in

4 this is an extremely nice paper showing this --

5 but that over time, probably in a period of time

6 after -- in fact, they speculate in a period of

7 time after those five years that a reduction in

8 the number of people who abuse opioids because

9 of abuse-deterrent formulations, there would

10 then be a reduction in the number of people

11 transitioning onto heroin simply because -- or

12 other illegal medication, illegal opioids simply

13 because there are fewer people at risk for that.

14   So he's not talking -- he's not --

15 first off, he's not talking about the first five

16 years. And second off, he's then not talking

17 about the thickness of the markets. He's making

18 an epidemiological statement about with fewer

19 people at risk, there will, therefore, be fewer

20 people to -- for whom that transition will

21 occur.

22   Q.   And he is suggesting that after the

23 first five years that there could be a reduction

24 in the death rates, correct?

---

1   A.   What he's saying -- he's not specific

2 about after the first five years. The reason

3 why he's referring to five years here is because

4 that's the nature of his analysis, it's his

5 analysis. So he's saying after the period of

6 time that I analyze, in which case there is

7 no -- there is no reduction.

8   It could be the case that at some

9 later time there would be a reduction if, for

10 example, fewer people begin taking prescription

11 opioids and, therefore, fewer people are at risk

12 for transitioning on to heroin. He's not giving

13 a specific time frame other than to say he does

14 not see any evidence of that within the time

15 frame that he looks at.

16   Q.   Have you conducted any analysis of

17 your own to see if that time frame with a

18 reduction in death rates has started?

19   A.   In the report that I put together, and

20 particularly in Professor Gruber's report,

21 Professor Gruber presents the most recent data

22 on trends in mortality from opioids, and there

23 is not evidence that mortality rates from

24 opioids, combined legal and illegal opioids, are

---

1 declining. So we've seen no evidence nationally

2 of any turnaround.

3   Q.   What about in Cuyahoga and Summit

4 County, have you conducted any research on that

5 issue for those two counties?

6   A.   I believe that the trends are in

7 Professor Gruber's report, and so if you'd like

8 I'd be happy to find them in Professor Gruber's

9 report. But I don't -- without looking at his

10 report, I do not recall specifically what the

11 trend would be -- what the trends are in the

12 very last year of the data.

13   Q.   Professor Cutler, if I could ask you

14 to turn now to Exhibit 10 to your deposition,

15 and this is the Alpert article that you

16 discussed earlier today, is that correct?

17   A.   That's correct, this is the Albert, et

18 al article.

19   Q.   And if I could ask you to turn to

20 Page 7 of the article, in the top paragraph, do

21 you see where they write, "However, a review

22 article," and they cite Compton, Jones, and

23 Baldwin, 2016, "argues that the reformulation

24 and other policies are not the main drivers of

---

1 the heroin epidemic because heroin use began to

2 rise prior to 2010"?

3   Do you see that?

4   A.   Yes, I do see that.

5   Q.   Have you reviewed that Compton article

6 from 2016?

7   A.   Yes, I have reviewed the Compton

8 article.

9   Q.   From looking at the articles that you

10 cite in your materials considered, I notice you

11 don't list the Compton article. Is there a

12 reason why it was omitted?

13   A.   What I tried to do in the list of

14 articles reviewed is to try and include those

15 articles that specifically had a point about

16 data or of methodology that was relevant to what

17 I was doing.

18   And I think Mr. Knapp asked the

19 question, I think it was yesterday, and I said I

20 didn't put in every academic article that had

21 anything to do with opioids because that would

22 have been a voluminous list.

23   So it was -- so that -- so that

24 article is something that informed my thinking,

1 but it did not directly inform the nature of the

2 analysis that I conducted for the report.

3   Q.   Do you recall if you have any

4 criticisms of the Compton article from 2016?

5   A.   So what's clear in the data -- two

6 things are clear in the data. One is that one

7 sees a bit of an increase in heroin mortality

8 rates prior to 20 -- prior to 2010. In the --

9 the Compton article shows that -- and it's also

10 shown, for example, in my Figure 3.4 show --

11 where you can see there's somewhat of an

12 increase in heroin mortality in the period just

13 before -- in the couple of years just before

14 2010. And you can also see that in my Figure

15 3.2 on Page 33 where you can see that.

16   And so what the Compton, et al article

17 does is it notes that, and notes that there is

18 an increase in mortality from heroin in that

19 period of time, and that is actually apparent in

20 the data.

21   But then what is particularly apparent

22 in the data is the very enormous change in

23 mortality from heroin both in a jump sense and

24 in a trend sense over time.

---

1   And so, in part, to address issues

2 like that, I estimated the models that I did,

3 which is to try and analyze in the data where

4 the transition from legal to illegal opioids --

5 where the data suggests the transition from

6 legal to illegal opioids really began. And the

7 data overwhelmingly believed that 2010 is a far

8 better period of time for the transition than,

9 say, 2007.

10   So I don't think the Compton article

11 is incorrect in noting the increase in heroin

12 mortality, it is absolutely there, but the far

13 bigger change is the very big jump and the very

14 rapid increase in trend beginning in 2010.

15   Q.   Is it fair to say the amount of the

16 increase is greater in 2010 than the amount of

17 the increase in 2007?

18   A.   In heroin mortality you're referring

19 to?

20   Q.   Yes.

21   A.   I believe it is the case. I haven't

22 done the specific analysis. But certainly

23 looking at the figures, it certainly appears to

24 be the case from, for example, Figure 3.2 in the

---

1 report that the increase in 2010 would be

2 greater than the increase in 2007. But, again,

3 I haven't done the specific analysis.

4   Q.   Do you agree that there is an increase

5 in heroin mortality in 2007 through 2009?

6   A.   Yes. In fact, you can see it quite

7 clearly in Figure 3.2 where beginning around

8 2007 there's an increase that levels off a

9 little bit somewhere in 2008, declines a little

10 bit just before 2010.

11   Q.   And in fact, if you look at Figure 1

12 to Exhibit 10, the Alpert article, they have in

13 panel C charted out drug overdose deaths due to

14 heroin, correct?

15   A.   Yes, that is correct, in panel C they

16 have drug overdose deaths due to heroin.

17   Q.   And their Figure 1, panel C also shows

18 an increase in drug overdose deaths from 2007 to

19 2009, correct?

20   A.   That's correct. And it's clear in all

21 the data presented in the different studies that

22 heroin mortality rose a little bit from 2007 to

23 2009.

24   Q.   You agree that the rise in heroin

---

1 mortality from 2007 to 2009 cannot be

2 attributable to the reformulation of OxyContin

3 in 2010, correct?

4   A.   That's correct. Those changes

5 preceded the reformulation of OxyContin, and

6 there's no indication that people had knowledge

7 that OxyContin was going to be reformulated, and

8 therefore switched drug consumption in advance

9 of that reformulation.

10   Q.   Do you agree that the increase in

11 heroin mortality in 2007 to 2009 was also not

12 due to any thickening of the heroin market

13 because of the reformulation of OxyContin in

14 2010?

15   MR. KO: Object to the form.

16   A.   There was a compound sentence in

17 there, and so I want to separate it out.

18   Do I believe that there could be some

19 part of the increase in heroin mortality from

20 2007 to 2009 associated with the thickening of

21 illegal drug markets? The answer to that is

22 yes, I do believe that there could be. I'm not

23 saying for certain, but I do believe there could

24 be.

1   Because remember, by 2007 there had

2   been approximately 11 or 12 years of people

3   taking medications. The changes that occurred

4   in people's availability to medications were not

5   exclusive to the reformulation of OxyContin in

6   2010, but they involved a number of issues as we

7   were talking about yesterday with respect to

8   Figure 3.1, including actions by public and

9   private insurers and government organizations

10 and bodies recommending to physicians that they

11 not be prescribing so many opioids.

12   So it is entirely possible -- again,

13 I'm not saying as an econometric statement it's

14 true -- but it's entirely possible that this

15 could be driven by people finding it more

16 difficult to get prescription opioids in some

17 areas and, therefore, turning to illegal

18 substances, particularly heroin.

19   The part of your compound statement

20 which is certainly true is that that increase

21 would not have been associated with a thickening

22 of markets driven by the reformulation of

23 OxyContin.

24   Q.   In response to a question asked by

1   Mr. Haller just a few minutes ago, you indicated

2   that some of the factors occurring in 2010 and

3   after was an increase in the price of

4   prescription opioids and a decrease in the

5   availability of prescription opioids. Do you

6   recall that testimony?

7   A.   I do. And just to be clear, by price,

8   I mean an economic definition of price which

9   includes both, obviously, the monetary cost but

10 also the time cost and the hassle and the

11 waiting cost and the shopping cost. So price

12 does not necessarily mean just dollars spent for

13 the medication.

14   Q.   You would agree that the increase in

15 heroin mortality from 2007 to 2009 took place

16 prior to the price and availability changes you

17 described in 2010 and after, correct?

18   MR. KO: Object to the form.

19   A.   I don't want to agree with the

20 sentence as you said it. Many of the changes

21 were diffusing slowly over this time period.

22 For example, restrictions by private insurers,

23 guideline recommendations to physicians, news

24 articles creating awareness among the clinical

1   community about the dangers associated with

2   OxyContin, about the misleading promotion of

3   these medications.

4   So I think there was in many ways a

5   gradual change in the willingness of physicians

6   to prescribe opioids and the specific -- in the

7   willingness, and that, therefore, the price that

8   individuals faced.

9   There was obviously one extremely

10 large change, which was the reformulation of

11 OxyContin to be abuse-deterrent. That does not

12 mean that there were no other changes. And, in

13 fact, Professor Rosenthal in her report goes

14 through quite a number of other things that were

15 going on that changed perceptions -- that

16 changed information and would have been expected

17 to influence perceptions of physicians about

18 whether to prescribe prescription opioids which

19 were not every single one completely synchronous

20 with the abuse-deterrent formulation of

21 OxyContin.

22   Q.   Let me ask this question, maybe make

23 it simpler.

24   You agree that the period of time from

1   2007 to 2009 predates 2010?

2   A.   I sure as heck hope we could all agree

3   on that.

4   Q.   All right. If I could ask you to turn

5   your attention to Page 15 of Exhibit 10, and

6   this is a concept I think you talked a little

7   bit about in one of your answers, but I want to

8   follow up.

9   If you look at the next to last

10 paragraph on Page 15 in the Alpert article, the

11 authors write, "In states with the highest

12 initial OxyContin misuse, the rate of OxyContin

13 misuse declined by nearly 50 percent after the

14 reformulation, while OxyContin misuse actually

15 increased slightly in states with the lowest

16 rates of initial OxyContin misuse."

17   Do you see that statement?

18   A.   Yes, I do see that statement.

19   Q.   And, Professor Cutler, my question to

20 you is, do you know where the State of Ohio

21 falls within the states in terms of initial --

22 highest initial OxyContin misuse or lowest rates

23 of initial OxyContin misuse?

24   A.   I do not know. My guess is it's in

1 the appendix, the online appendix to the Alpert,

2 et al article, but I don't have that off the top

3 of my head.

4   (Whereupon, Cutler Exhibit Number 17

5   was marked for identification.)

6 BY MR. GEISE:

7   Q.   Professor Cutler, I'm going to hand

8 you my only copy of the appendix that I think

9 you're referring to, and my question is going to

10 simply be, on the first page you see that

11 there's a color coding of states in terms of the

12 highest initial misuse of OxyContin, and it's in

13 a quartile, correct?

14   A.   That's correct. There seem to be four

15 buckets. I'm not sure whether they're

16 quartiles.

17   Q.   Fair enough.

18   A.   But they look approximately like

19 quartiles.

20   Q.   There are four buckets, and the top

21 bucket has the highest amount of misuse,

22 correct?

23   A.   The print is too small for me to read

24 directly, but I will take your word for it.

1   Q.   And would you take my word for it

2 that, according to the color-coding, that Ohio

3 falls in that third bucket in terms of misuse?

4   A.   I will take your word for it.

5   MR. KO: And I'll just note for the

6 record while it's true it is color-coded, this

7 particular one is black and white, so there are

8 various shades of gray.

9   MR. GEISE: We're all dealing with

10 shades of gray here, aren't we?

11   MR. KO: Intentional statement.

12 BY MR. GEISE:

13   Q.   Professor Cutler, I'd like to turn

14 your attention now to your expert report, and in

15 particular the Data Considered section of your

16 appendix. And I -- there will be a couple of

17 things I'm going to ask you.

18   If you could turn to Page 6 of

19 Appendix 3.B where you have a list of the data

20 sources considered.

21   Do you see that?

22   A.   Yes, I do see that.

23   Q.   And I believe in response to some

24 questioning yesterday you were asked about ARCOS

1 data, and you were asked if you were aware of

2 any protective orders that applied to ARCOS

3 data.

4   Do you recall that question?

5   A.   Yes, I do recall that question.

6   Q.   And I want to ask you, do you -- did

7 you sign a protective order for access to any

8 ARCOS data in this matter?

9   A.   In this specific report, the ARCOS

10 data that are used are the public ARCOS data.

11 Those data are available on the DEA website.

12 They don't require any protective order in order

13 to access those data.

14   Q.   Do you --

15   A.   I do know --

16   Q.   I'm sorry.

17   A.   ARCOS -- I know that ARCOS maintains

18 other data which is protected. In my report,

19 I'm not using any protected ARCOS data.

20   Q.   Do you know if the individuals you've

21 worked with at Compass Lexecon have accessed any

22 of the non-public ARCOS data for purposes of

23 their assistance to you and others in this case?

24   A.   For purposes of their assistance to

1 me, they did not access any of the non-public

2 ARCOS data. I don't know -- I'm not in a

3 position to say for sure whether they accessed

4 any of the non-public ARCOS data for any other

5 purpose associated with this litigation.

6   Q.   Do you know if any of the materials

7 you've been provided in this case, no matter

8 what the source, obtained their -- or derived

9 from non-public ARCOS data?

10   MR. KO: Object to the form.

11   A.   I'm sorry. Could you restate the

12 question, please?

13 BY MR. GEISE:

14   Q.   Sure.

15   Do you know if you've been provided

16 any materials in this case that came from

17 non-public ARCOS data?

18   A.   I do not know of any materials I was

19 provided that came from non-public ARCOS data.

20   Q.   Professor Cutler, yesterday you

21 indicated that you had some familiarity with the

22 fact that NCHS has a data use agreement. Do you

23 recall that testimony?

24   A.   That is correct, NCHS does have a data

1 use agreement.

2   Q.   Did you sign a data use agreement from

3 NCHS in this case?

4   MR. KO: Objection. Asked and

5 answered.

6   Go ahead.

7   A.   Yes, I did sign a data use agreement

8 from NCHS in this case.

9 BY MR. GEISE:

10   Q.   When did you sign that data use

11 agreement?

12   A.   I believe it would have been signed

13 in -- my guess is June of last year.

14   Q.   Did the data use agreement that you

15 signed with NCHS have a provision about the use

16 of restricted access data?

17   A.   You're referring to restricted access

18 NCHS data?

19   Q.   That's correct, sir.

20   A.   Yes. Just to fill this out, the

21 mortality data that we utilize come from both

22 public sources and from sources which require a

23 data use agreement. So some of the data,

24 particularly the data before 2005, are available

1 publicly by county. Other data, national data

2 post 2005, are available publicly. But the

3 county-level data post 2005 need to be -- to

4 have a data use agreement in order to use those

5 data.

6   Q.   For the data use agreement for the

7 county-level mortality data post 2005, are there

8 any restrictions on the use of that data?

9   A.   There are restrictions on what can be

10 reported. So one cannot report sales of under a

11 certain size, and one cannot release the data,

12 and the data have to be used for the purpose

13 which NCHS approved. So an individual is not

14 granted the right to use the data for any

15 purpose that he or she wishes. The individual

16 needs to use the data for the purpose for which

17 NCHS approved it.

18   Q.   For what purpose did you request

19 approval from NCHS for use of that data?

20   MR. KO: Object to the form.

21   A.   The original approval for -- the

22 original approval for the NCHS data came from

23 Ted Miller, and Ted had requested use of the

24 data for the purpose of doing this type of

1 analysis.

2 BY MR. GEISE:

3   Q.   Did you yourself request approval for

4 use of the data, or are you relying on the

5 original approval from Ted Miller?

6   A.   In the analysis here we're relying on

7 the data from Ted Miller. I do have access to

8 the data separately for research purposes, so I

9 have applied to NCHS and received approval to

10 use data for research purposes, but that is not

11 the data that are used here.

12   Q.   Do you understand that it would be

13 inappropriate for you to rely on the approval

14 you have to use the research -- to use the

15 materials for research purposes to use it as an

16 expert witness in this matter?

17   A.   I absolutely understand that if I have

18 access to the data for research purposes, I

19 cannot use that for expert report purposes. In

20 fact, at several times during this analysis I

21 told my colleagues I have access to the NCHS

22 data for research purposes and I am not able to

23 use it for the purposes of this analysis.

24   Q.   Have you seen the scope of the

1 approval that Ted Miller obtained for use of the

2 materials?

3   MR. KO: Object to the form.

4   A.   I believe I saw it. Yes, I would have

5 seen the scope that Ted Miller had for use of

6 the data.

7 BY MR. GEISE:

8   Q.   Does the scope that Ted Miller

9 received for use of the data allow the use of

10 the data for purposes of expert witness work in

11 this case?

12   A.   My understanding is that it does. I

13 do not have the language with me here so I

14 cannot look at it specifically here.

15   Q.   Given that you are a precise person,

16 did you ask Mr. Miller to make sure that the

17 approval was appropriate for using that data in

18 this case?

19   A.   Yes, I did ask Mr. Miller that.

20   Q.   Did you ask Mr. Miller to see a copy

21 of the data use agreement?

22   A.   I had to sign, I believe, the data use

23 agreement, in which case I would have seen a

24 copy of it.

1   Q.   Have you had any contact with the NCHS

2   confidentiality officer with regard to the use

3   of the data as approved in Ted Miller's request?

4   MR. KO: Object to the form.

5   A.   I have not had any conversation with

6   the confidentiality officer with respect to the

7   data in Ted Miller's use agreement.

8   BY MR. GEISE:

9   Q.   How does the scope of the data use

10 agreement you have for research purposes differ

11 from the scope of the data use agreement Ted

12 Miller obtained?

13   A.   The data use agreement that I have for

14 research purposes, technically I have two data

15 use agreements for research purposes because

16 there are two research projects that I am

17 engaged in, they each specify the topics that I

18 am able to use the data for.

19   In one case it is for research that

20 I'm conducting on opioid issues. In another

21 case it's for research on how education

22 differences across areas are related at a point

23 in time and over time to overall mortality rates

24 in areas.

1   So those are very specific research

2   projects that I have. I should -- yes, so those

3   are the very specific research projects that I

4   have.

5   Q.   And I guess my question was, how does

6   the scope of the data use agreements you have

7   for use of that data compare to the data use

8   agreement that Ted Miller obtained?

9   A.   Ted Miller has data for a very

10 different purpose, so his data were for analysis

11 of the relationship between opioids and

12 mortality. I don't remember the exact title of

13 it, but it would have been something to that

14 effect. And that's the analysis then permitted

15 by his data use agreement.

16   Q.   Did Ted Miller's data use agreement

17 specifically provide for the use of the data in

18 litigation?

19   MR. KO: Object to the form.

20 Objection, asked and answered.

21   A.   I don't recall the specifics of the

22 data use agreement, so I would need to go -- to

23 go look at it. It was my understanding, Ted's

24 understanding, Compass Lexecon's understanding,

1   and the lawyers' understanding that that data

2   use agreement was appropriate to do this

3   analysis.

4   BY MR. GEISE:

5   Q.   In your discussions of matters

6   relevant to this case with Professors Gruber and

7   McGuire, did you discuss the post-2005

8   county-level mortality data with the two of

9   them?

10   MR. KO: And I'll instruct the

11 answer -- or I'll instruct the witness not to

12 answer to the extent these discussions with

13 Professor McGuire and Professor Cutler were with

14 or involved counsel.

15   A.   These discussions were with or

16 involved counsel.

17 BY MR. GEISE:

18   Q.   Do you know if Professor Gruber signed

19 a data use agreement with respect to NCHS data

20 for purposes of this case?

21   A.   I do not know if he signed a data use

22 agreement for purposes of this case.

23   Q.   Because you are precise, Professor

24 Cutler, would you have made sure that Professor

1   Gruber had signed such an agreement before you

2   discussed that data with him?

3   MR. KO: Object to the form. Object

4   to the extent you need to reveal any

5   communications you had with Professor Gruber

6   that were in the presence or involved or were

7   with counsel.

8   A.   The NCHS data come with some

9   restrictions on what one can report. For

10 example, you cannot report cells with fewer than

11 ten observations. Presenting results of

12 estimation models is not something that's

13 prohibited by the data use agreement. And,

14 similarly, presenting trends across different

15 types of counties or across different groups

16 would not be in violation of any data use

17 agreement.

18 BY MR. GEISE:

19   Q.   Professor Cutler, my question is

20 whether you would make sure that Professor

21 Gruber had signed a data use agreement before

22 discussing that data with him.

23   MR. KO: Same objections as before.

24 Same instructions as before. Objection, asked

1   and answered.

2   A.   If Professor Gruber were going to work

3   with data as it were covered by the data use

4   agreement, that is access to data that needs to

5   be kept confidential, then he would have to be

6   part of the data use agreement.

7   If someone is just viewing results and

8   commenting upon results, they do not need to be

9   part of the data use agreement, provided that

10 the results that they're reviewing do not fall

11 under the restrictions for which the data use

12 agreement says you cannot disclose results.

13 BY MR. GEISE:

14   Q.   Do the results contained in your

15 expert report include data that was only usable

16 to you because you had signed a data use

17 agreement with NCHS?

18   A.   Yes. Some of the data involved in the

19 estimation involved data that were obtained

20 under the data use agreement.

21   Q.   And as you said, did you share your

22 report with Professor Gruber?

23   A.   Professor Gruber, yes, did receive --

24 did see the report, yes.

1   Q.   And I know you said you haven't had an

2   opportunity to review Professor Gruber's

3   deposition, but one of the things he indicated

4   is that you and he and Professor McGuire would

5   discuss each other's reports with them during

6   the formative process. Is that accurate?

7   A.   Yes, that is accurate.

8   Q.   So as part of that discussion in the

9   formation of your report, did you discuss with

10 Professor Gruber data that was subject to the

11 data use agreement that you signed with NCHS?

12   MR. KO: Objection. Asked and

13 answered.

14   A.   We discussed results of analysis. At

15 no time did we specifically discuss or was sent

16 around any data that was prohibited by the data

17 use agreement from being shared and discussed.

18   MR. GEISE: Professor Cutler, I think

19 we're within five minutes here. In case

20 somebody else has a minute or two, let's go off

21 the record. And I appreciate your time in

22 answering my questions today.

23   THE VIDEOGRAPHER: The time is

24 4:12 p.m., and we're off the record.

1   (Pause.)

2   THE VIDEOGRAPHER: The time is

3   4:13 p.m., and we're on the record.

4   MR. GEISE: Professor Cutler, after

5   conferring with my colleagues in the room, we

6   have no further questions for you this

7   afternoon. Thank you.

8   THE WITNESS: Thank you for the

9   discussion.

10   MR. KO: Professor Cutler, I just

11 actually have a few quick follow-up questions.

12 And I understand that it is your anniversary

13 today, so I apologize that I'm not letting you

14 go right away, but I promise this will be quick.

15   THE WITNESS: Thank you, sir.

16   EXAMINATION

17 BY MR. KO:

18   Q.   So earlier today Mr. Knapp asked you

19 questions regarding your direct regression

20 model.

21   Do you recall that?

22   A.   Yes, I do.

23   Q.   Can you please turn to Appendix 3.H of

24 your report. Please let me know when you get

1   there.

2   A.   Yes, I am there.

3   Q.   And the first page of this report, and

4   where you're at is the actual direct regression

5   model that you ran, correct?

6   A.   That is correct.

7   Q.   And the first page of Appendix 3.H

8   contains, among other things, the variables that

9   you utilized in your direct regression model,

10 correct?

11   A.   That is correct.

12   Q.   Approximately how many variables are

13 included in this direct regression model on the

14 first page of Appendix 3.H?

15   A.   There are about 45 of them.

16   Q.   And why did you believe these were the

17 appropriate variables to utilize for your direct

18 regression model?

19   A.   We included in the model all the

20 variables that we could measure that either we

21 or other studies suggested would have an impact

22 on the mortality rate.

23   Q.   Okay. And on the top right-hand

24 corner there is a reference to adjusted

1   R-squared which we discussed at moments -- or at

2   some times earlier this afternoon.

3   Do you see that?

4   A.   Yes, I do see that.

5   Q.   Can you describe to the jury what that

6   actually signifies?

7   A.   Yes. The R-squared is a measure of

8   how well the model is fitting the data, so it

9   ranges between zero and 1. A value of zero

10 means that your model cannot explain any of the

11 data difference -- any of the data variation.

12 An R-squared of 1 means that there's a perfect

13 relationship. So, for example, height in inches

14 versus height in meters would have a perfect

15 relationship with each other.

16   This particular adjusted R-squared,

17 adjusted just means it corrects for the number

18 of regressors, the number of variables that are

19 included. This particular adjusted R-squared of

20 0.57, or 57 percent, shows that the model is

21 explaining 57 percent of the variation across

22 areas.

23   That is an extremely high R-squared

24 for regression that's using cross-section data.

1   So any economist who looked at a number like

2   that in this context would feel like the model

3   was a very good model.

4   Q.   Mr. Knapp also asked you some

5   questions yesterday regarding the Ohio PCSAO

6   data.

7   Do you recall that?

8   A.   That is -- yes, I do recall that.

9   Q.   And I believe he asked you about the

10 years for which you had data from that report

11 that went into your analysis regarding the

12 opioid-related percent of child removals.

13   Do you recall that?

14   A.   Yes, I do recall that.

15   Q.   And if I understood your testimony and

16 the exhibit Mr. Knapp showed you correctly, I

17 believe that the report from the Ohio PCSAO had

18 some missing data for years prior to 2015.

19   A.   That's correct. Unfortunately, they

20 gathered the data only in 2015.

21   Q.   And in your report -- and I see that

22 you're actually at Appendix 3.E.1, you have

23 input data for years prior to 2015, correct?

24   A.   That's correct. We've made an

1   estimate of what we believe is a reasonable

2   number for years prior to 2015.

3   Q.   And can you describe to the jury and

4   the court what you did to make that reasonable

5   estimate?

6   A.   Yes. So what -- of course, we don't

7   have the trend in child removals. What we have

8   is the trend in something that is very severe as

9   well, and that is people treated by the ADAMHS

10 Board in Cuyahoga and the ADM Board in Summit,

11 and we know those by year.

12   So what we do is we assume that there

13 would have been the same proportionate growth in

14 child removals in those years as in people

15 treated by the ADAMHS Board and the ADM Board.

16 So we're directly using information on people

17 with opioid use issues in Ohio to -- in these

18 counties in Ohio to estimate these values.

19   Q.   Okay. Thank you.

20   Final set of questions.

21   Earlier today Mr. Knapp and Mr. Geise

22 had asked you questions about the Evans article

23 that is reflected in Exhibit 9 of your

24 deposition. Do you recall that series of

1   questions regarding this article?

2   A.   Yes, I do.

3   Q.   And I want to turn your attention to

4   Page 6 of this article titled "How the

5   Reformulation of OxyContin Ignited the Heroin

6   Epidemic" and, in particular, the table in the

7   top left-hand corner of Figure 3.

8   Do you see that?

9   A.   Yes, I do see that.

10   Q.   Can you describe to the court and to

11 the jury what that figure represents?

12   A.   Yes. What Evans, et al are showing is

13 the trend in quarterly shipments of oxycodone

14 over the time period from 2004 to 2014, so you

15 can see that they are, in fact, analyzing

16 oxycodone.

17   They show a very marked increase in

18 the first part of this period up until the

19 reformulation of OxyContin, and then a decline

20 after that period. So their estimates shown in

21 the -- with the F statistic in the circles show

22 a very sharp break around that period in time in

23 oxycodone shipments.

24   Q.   So this figure takes into account

1   shipments of opioids, and in particular

2   oxycodone, prior to 2010 that caused heroin

3   poisonings following 2010, correct?

4   A.   That is correct.

5   MR. GEISE: Object to form.

6   MS. CASTLES: Object to form.

7   MR. KO: That's all I have.

8   THE VIDEOGRAPHER: The time is

9   4:19 p.m. This deposition has concluded, and we

10 are off the record.

11   (Whereupon, the deposition was

12   concluded.)

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1   COMMONWEALTH OF MASSACHUSETTS)

2   SUFFOLK, SS.   )

3   I, MAUREEN O'CONNOR POLLARD, RMR, CLR,

4   and Notary Public in and for the Commonwealth of

5   Massachusetts, do certify that on the 27th day

6   of April, 2019, at 8:06 o'clock, the person

7   above-named was duly sworn to testify to the

8   truth of their knowledge, and examined, and such

9   examination reduced to typewriting under my

10 direction, and is a true record of the testimony

11 given by the witness. I further certify that I

12 am neither attorney, related or employed by any

13 of the parties to this action, and that I am not

14 a relative or employee of any attorney employed

15 by the parties hereto, or financially interested

16 in the action.

17   In witness whereof, I have hereunto

18 set my hand this 29th day of April, 2019.

19

20 _____

21   MAUREEN O'CONNOR POLLARD, NOTARY PUBLIC

22   Realtime Systems Administrator

23   CSR #149108

24

1   INSTRUCTIONS TO WITNESS

2

3   Please read your deposition over

4   carefully and make any necessary corrections.

5   You should state the reason in the appropriate

6   space on the errata sheet for any corrections

7   that are made.

8   After doing so, please sign the

9   errata sheet and date it. It will be attached

10 to your deposition.

11   It is imperative that you return

12 the original errata sheet to the deposing

13 attorney within thirty (30) days of receipt of

14 the deposition transcript by you. If you fail

15 to do so, the deposition transcript may be

16 deemed to be accurate and may be used in court.

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 2                ACKNOWLEDGMENT OF DEPONENT
 3
 4          I, _____, do
     Hereby certify that I have read the foregoing
 5   pages, and that the same is a correct
     transcription of the answers given by me to the
 6   questions therein propounded, except for the
     corrections or changes in form or substance, if
 7   any, noted in the attached Errata Sheet.
 8
 9   _____
     DAVID CUTLER, Ph.D.            DATE
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16   Subscribed and sworn
     To before me this
17   _____ day of _____, 20____.
18   My commission expires: _____
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